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EPA Contract No.: 68-W8-0093
Work Assignment No.: 17-5L4J
Donohue Project No.: 20026.001

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VOLUME 1A

WORK PLAN

HIMCO DUMP
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
ELKHART, INDIANA

FINAL JULY 1990

Prepared for:

U.S. Environmental Protection Agency
Emergency and Remedial Response Branch
Region V
230 South Dearborn Street
Chicago, Illinois 60604

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WORK PLAN HIMCO DUMP REMEDIAL INVESTIGATION/FEASIBILITY STUDY ELKHART, INDIANA

FINAL JULY 1990

Prepared by:		
	Vanessa Harris	Date
	Site Manager	
	Donohue & Associates, Inc.	
Approved by:	Roman M. Gau, P.E.	Date
	Project Manager	-200
	Donohue & Associates, Inc.	
	Michael L. Crosser	Date
	Technical Services/Quality Assurance Manager	
	Donohue & Associates, Inc.	

Himco Dump RI/FS

Final Work Plan
EPA Contract No.: 68-W8-0093

Section No.: Contents

Revision No.: 0
Date: July 1990

TABLE OF CONTENTS

<u>Section</u>				Page	
Executiv	e Sum	mary			
1.0	INTR	ODUCTION		1-1	
2.0	SITE	BACKGROU	UND AND SETTING	2-1	
	2.1	Locatio	on, Site History, and Past Response Actions	2-1	
		2.1.1	Location	2-1	
		2.1.2	Site History and Response Actions	2-1	
		2.1.3	Current Conditions	2-2	
	2.2	Physica	al and Cultural Setting	2-4	
		2.2.1	Geology	2-4	
			2.2.1.1 Regional Geology	2-4	
			2.2.1.2 Site Geology	2-5	
		2.2.2	Surficial Soils	2-5	
		2.2.3	Groundwater Hydrology	2-6	
			2.2.3.1 Regional Hydrogeology	2-6	
			2.2.3.2 Site-Specific Hydrogeology	2-7	
		2.2.4	Regional and Site Topography	2-7	
		2.2.5	Surface Waters	2-8	
		2.2.6	Climate	2-8	
		2.2.7	Population and Land Use	2-8	
3.0	INIT	IAL EVALU	UATION	3-1	
	3.1	Types a	and Volumes of Waste Present	3-1	
	3.2	Potenti	ial Contaminant Migration Pathways and		
		Prelimi	inary Public Health and Environmental Impacts	3-1	
	3.3	Prelimi	inary Identification of Remedial Response		
		Objecti	ives and General Response Actions	3-3	
	3.4	Prelimi	inary Identification of Applicable or		
		Relevar	nt and Appropriate Requirements (ARARs)		
		and To-	-Be-Considered Requirements (TBCs)	3-8	
		3.4.1	Potential Applicable or Relevant and		
			Appropriate Requirements	3-8	
		3.4.2	Potential To-Be-Considered Requirements	3-8	
4.0	WORK	PLAN RAT	TIONALE AND APPROACH	4-1	
	4.1		uality Objectives (DQOs)	4-1	
	4.2	Remedia	al Investigation Approach	4-5	
		4.2.1	Introduction	4-5	
		4.2.2	Phase I RI	4-6	
		4.2.3	Phase II RI	4-8	
	4.3	Feasib	ility Study Approach	4-8	

Final Work Plan
EPA Contract No.: 68-W8-0093

Section No.: Contents

Revision No.: 0
Date: July 1990

TABLE OF CONTENTS (CONTINUED)

Section			Page
5.0	REMED:	IAL INVESTIGATION/FEASIBILITY STUDY TASKS	5-1
	5.1	Task 1 - Project Planning	
	5.2	Task 2 - Field Investigation	
		5.2.1 Investigative Support	5-1
		5.2.2 Field Investigation	5-2
	5.3	Task 3 - Sample Analysis and Data Validation	
	5.4	Task 4 - Data Evaluation	
	5.5	Task 5 - Risk Assessment	
	5.6	Task 6 - Treatability Studies	
	5.7	Task 7 - RI Report	5-3
	5.8	Task 8 - Remedial Alternatives Development and Screening	5-3
		5.8.1 Development of Remedial Action Objectives	
		5.8.2 Development of General Response Actions	
		5.8.3 Identification of Volumes or Areas of Media	
		5.8.4 Identification and Screening of Remedial	5-4
		Technologies and Process Options	5-5
		5.8.5 Evaluation of Process Options	
		5.8.6 Assembly of Alternatives	
		5.8.7 Alternatives Definition	
		5.8.8 Screening Evaluation of Alternatives	
		5.8.9 Selection of Alternatives for Detailed	•• • •
		Analysis	5-8
		5.8.10 Post-Screening Tasks	
	5.9	Task 9 - Detailed Analysis of Alternatives	
	3.3	5.9.1 Alternative Definition	
		5.9.2 Individual Analysis of Alternatives	
		5.9.3 Comparative Evaluation of Acceptable	5 5
		Alternatives	5-11
		5.9.4 Cost-Effectiveness Analysis	
		5.9.5 Decision Analysis (Sensitivity Analysis)	
	5.10	Task 10 - Feasibility Study (FS) Report	
		5.10.1 Draft FS Report	
		5.10.2 Public Meeting	
		5.10.3 Final FS Report	
	5.11	Task 11 - Enforcement Support	
		5.11.1 104(e) Notice Support	
		5.11.2 Negotiation Meetings	
		5.11.3 Briefing Materials	
		5.11.4 Historical Ownership of Landfill Property	
	5.12	Task 12 - Administrative Record	5-13
	5.13	Task 13 - Project Management	
6.0	COSTS	AND KEY ASSUMPTIONS	6-1
7.0	SCHED	ULE	7-1

Himco Dump RI/FS Section No.: Contents

Final Work Plan

EPA Contract No.: 68-W8-0093

Revision No.: 0
Date: July 1990

TABLE OF CONTENTS (CONTINUED)

Section			Page
8.0	PROJEC 8.1 8.2 8.3	Organization	
		LIST OF APPENDICES	
Appendix	Α	Preliminary Screening of Technologies and Process Options	S
Appendix	В	Endangerment Assessment Plan	
Appendix	С	Ecological Assessment Plan	
Appendix	D	Proposed Project Plan Schedule	
Appendix	E	Background Information	

Himco Dump RI/FS
Final Work Plan

Final Work Plan
EPA Contract No.: 68-W8-0093

Section No.: Contents

Revision No.: 0
Date: July 1990

LIST OF TABLES

TABLE	TITLE	FOLLOWING PAGE
3-1	Preliminary Identification of Remedial Action Objectives, General Response Actions, and	
	Technology Types	3-3
4-1	Preliminary Data Needs Related to Remedial Technologies	4-1
6-1	Anticipated Subcontracts	6-1
	LIST OF FIGURES	
FIGURE	TITLE	FOLLOWING PAGE
2-1	Site Location	2-1
2-2	Existing Site Conditions	2-2
2-3	Bedrock Topography in Parts of Elkhart	2-4
2-4	Cenozoic Geology of Elkhart County, Indiana	2-4
2-5	Geologic Cross-Section through Himco Dump	2-5
2-6	Thickness and Extent of Clay Confining Layer	2-6
2-7	Potentiometric Map of Confined Aquifer	2-6
3-1	Conceptual Site Model	3-1
8-1	Project Organization	8-1

Himco Dump RI/FS Section No.: Executive Summary Final Work Plan Revision No.: 0

Final Work Plan
EPA Contract No.: 68-W8-0093

EXECUTIVE SUMMARY

Date: July 1990

Donohue & Associates, Inc. (Donohue) is submitting this Work Plan to the U.S. Environmental Protection Agency (EPA) to conduct a Remedial Investigation/Feasibility Study (RI/FS) for the Himco Dump Superfund Site in response to Work Assignment No. 17-5L4J under Region V ARCS Contract No. 68-W8-0093.

The Himco Dump site is a closed landfill located at County Road 10 and the Nappanee Street extension in the Town of Elkhart, Elkhart County, Indiana. The site covers approximately 50 acres that was in operation between 1960 and 1976. Prior to development of the landfill, the area was marsh and grassland. There was no liner, leachate, or gas recovery system constructed for the landfill. Approximately two-thirds of the waste present in the dump was calcium sulfate. Other wastes accepted at the landfill included demolition/construction debris, industrial and hospital wastes, and, to a minor degree, household refuse.

In 1974, nearby residents of the Himco Dump complained to the Indiana State Board of Health (ISBH) about color, taste, and odor problems in their shallow wells. The State sampled these wells and analyzed for the following parameters: COD, chloride, dissolved solids, metals, and sulfates. Analysis of these wells showed high levels of manganese and iron. Himco was advised by ISBH to replace six shallow wells for residences immediately south of the landfill on County Road 10. The old wells were finished at depths of approximately 22 feet; the new wells were finished at depths ranging from 152 to 172 feet below ground surface.

In 1975, Mr. Himes signed a consent agreement with the ISBH Stream Pollution Control Board to close the dump by September of 1976. The final cover consisted of calcium sulfate overlain by sand.

In 1980, the United States Geological Survey (USGS) conducted a hydrogeological study of northwestern Elkhart County, Indiana. As part of the report, the USGS determined the horizontal and vertical extent of the leachate plume from the Himco Dump using concentrations of bromide in the groundwater. The bromide concentrations in groundwater have been monitored from 1979 to the present.

In 1984, a field investigation team (FIT), under the auspicies of the U.S. EPA, conducted a site inspection at Himco Dump. Laboratory analysis of wells sampled by the FIT members showed that the groundwater was impacted by metals and volatile organic compounds. At the time of the site inspection, leachate seeps were observed by the FIT members. The results of the FIT analyses of USGS wells is included in Appendix E.

The existing data base indicates that the primary potential contaminants associated with the Himco Dump site are heavy metals, and semivolatile and volatile organic compounds.

During the planning process, preliminary response objectives and remedial action alternatives have been identified, and a preliminary list of applicable or relevant and appropriate requirements (ARARs) has been completed.

Himco Dump RI/FS Section No.: Executive Summary

Final Work Plan Revision No.: 0
EPA Contract No.: 68-W8-0093 Date: July 1990

Based on review of existing data and with reference to a Site Conceptual Model, RI/FS data quality objectives have been defined comprising decision types, data uses, data needs, and data analytical levels.

The primary objectives of the Himco Dump RI/FS are to:

- Characterize the nature and extent of contamination in site soils, sediment, surface water, and groundwater.
- Determine the potential for contaminant transport via air, groundwater, and sediment/surface water pathways.
- Conduct a baseline public health evaluation and an ecological endangerment assessment as appropriate for the site.
- Identify and develop standards and criteria for contaminant cleanup.
- Evaluate a range of feasible, permanent solutions for on-site remediation in accordance with the Superfund Amendments and Reauthorization Act.

The RI will be implemented by evaluating existing data and conducting a multiphased field investigation, if necessary. The scope of any Phase II field investigation will be dependent on whether a source exists and releases to groundwater, surface water, sediment, or air have occurred.

The scope of the field investigation will include:

- Site survey and topographic mapping.
- Electromagnetic survey for fill boundary determination.
- Magnetic survey to identify presence of buried drums.
- Excavation of test pits.
- Determination of presence/absence of wetlands.
- Wetland soil sampling and analysis.
- Monitoring well installation, sampling, and analysis.
- Soil boring sampling and analysis.
- Existing monitoring well sampling and analysis.
- Private well sampling and analysis.
- Leachate sampling and analysis.
- Landfill waste sampling and geotechnical analysis.
- Landfill cap surface soil sampling and analysis.
- Landfill waste mass gas sampling and analysis.
- Residential gas sampling.
- Sediment and surface water sampling and analysis.
- Installation of staff gauges.

Himco Dump RI/FS Section No.: Executive Summary

Final Work Plan Revision No.: 0
EPA Contract No.: 68-W8-0093 Date: July 1990

This Work Plan and the associated project plans are contained in five volumes. Volume 1A presents the technical scope of work and includes a discussion of site background and setting, an initial evaluation of the site, the Work Plan rationale and approach, a discussion of the RI/FS tasks to be completed, a schedule for completion of the tasks, and a discussion of project management. An Endangerment Assessment Plan is included as Appendix B. An Ecological Assessment Plan is included as Appendix C. The costs and key assumptions associated with the RI/FS are contained in Volume 1B. Volume 2 contains the Field Sampling Plan (FSP); Volume 3 contains the Quality Assurance Project Plan (QAPP); and Volume 4 contains the Health and Safety Plan (HSP).

Himco Dump RI/FS
Final Work Plan
EPA Contract No.: 68-W8-0093

Section No.: 1.0 Revision No.: 0 Date: July 1990

1.0 INTRODUCTION

Donohue & Associates, Inc. (Donohue) is submitting this Work Plan to the U.S. Environmental Protection Agency (EPA) to conduct a Remedial Investigation/Feasibility Study (RI/FS) for the Himco Dump Superfund Site in response to Work Assignment No. 14-5LJ4 under Region V ARCS Contract No. 68-W8-0093.

This Work Plan and the associated project plans are contained in five volumes. Volume 1A presents the technical scope of work and includes a discussion of site background and setting, an initial evaluation of the site including waste present and the potential pathways of contaminant migration, the Work Plan rationale including data quality objectives, and the Work Plan approach. Also included in Volume 1A is discussion of the RI/FS tasks to be completed, a schedule for completion of the tasks, and a discussion of project management. The Endangerment Assessment Plan is included in Appendix B; the Ecological Assessment Plan is included as Appendix C. The costs and key assumptions associated with the RI/FS are contained in Volume 1B.

Volume 2 contains the Field Sampling Plan (FSP), Volume 3 contains the Quality Assurance Project Plan (QAPP), and Volume 4 contains the Health and Safety Plan (HASP).

This RI/FS Work Plan has been prepared in accordance with current EPA guidance documents including:

- Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final (EPA, October 1988; OSWER Directive No. 9335.3-01).
- 2. Data Quality Objectives for Remedial Response Activities Development Process (EPA, March 1987; OSWER Directive 9355.0-7b).
- 3. Risk Assessment Guidance for Superfund-Human Health Evaluation Manual (HHEM), Part A, 1989, EPA/540/1-89/002.
- 4. Environmental Evaluation Manual, Volume 2, 1989, EPA/1-89/001.
- 5. Superfund Exposure Assessment Manual (EPA/540/1-88/001).

Before completing this Work Plan, Donohue conducted the following activities:

- 1. Reviewed background information concerning the site.
- 2. Completed a pre-work plan scoping meetings with representatives from the USEPA.
- 3. Conducted project scoping meetings involving technical specialists.
- 4. Conducted a site visit.

Himco Dump RI/FS Section No.: 1.0
Final Work Plan Revision No.: 0
EPA Contract No.: 68-W8-0093 Date: July 1990

5. Conducted a meeting to specify data needs and data quality objectives based on the discussions during the scoping meetings.

6. Completed a pre-QAPP meeting with EPA Environmental Services Division personnel to discuss the contents of the QAPP and FSP.

The purpose of the RI is to determine the nature, extent, and sources of contamination at the Himco Dump site and to gather data necessary to support a human health risk and ecological assessment and a feasibility study. The investigation will include waste characterization, electromagnetic/magnetic surveys, excavation of test pits, determination of the presence/absence of wetlands, wetland soil sampling and analysis, surface water and sediment sampling and analysis, soil sampling and analysis, waste mass gas investigation, residential gas sampling, determination of hydrogeologic characteristics, and groundwater characterization.

The purpose of the FS is to develop and evaluate a range of appropriate remedial action alternatives based on technical, environmental, public health, and economic considerations.

2.0 SITE BACKGROUND AND SETTING

Section No.: 2.0

Revision No.: 0

Date: July 1990

2.1 LOCATION, SITE HISTORY, AND PAST RESPONSE ACTIONS

2.1.1 Location

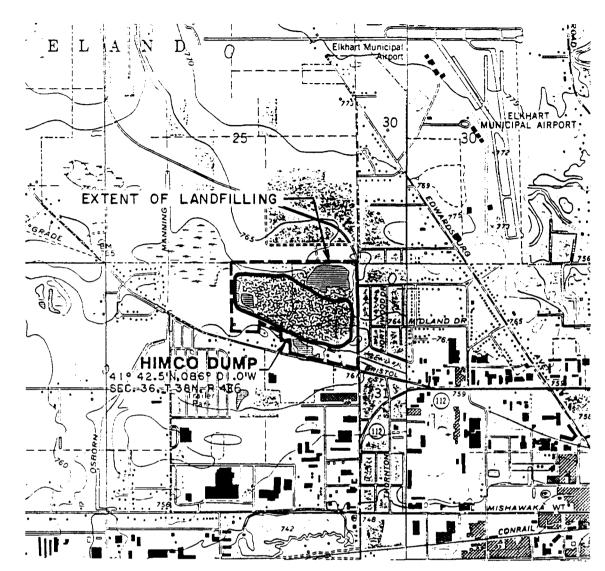
The Himco Dump site is a closed landfill located at County Road 10 and the Nappanee Street extension in the town of Elkhart, located in Elkhart County, Indiana (Figure 2-1). The site covers approximately 50 acres in the Northeast quarter of Section 36, Township 38 North, Range 4 East, in Cleveland Township. The site is bounded on the north by a tree line and northernmost extent of the gravel pit pond; on the west by the fish pond; on the south by County Road 10 and the private residences; and on the east by the Nappanee Street extension. The vicinity of the site is agricultural, residential, and light industrial.

2.1.2 Site History and Response Actions

The Himco Dump site was privately operated by Himco Waste Away Service, Inc. that was in operation between 1960 and September 1976. A brief history of the Himco Dump site was provided by Chuck Himes, principal landfill operator during the site visit on November 9, 1989. The area was initially a marsh and grassland. There was no liner, and no leachate, or gas recovery system constructed for the landfill. According to the former operator of the site, refuse was placed at ground surface across the site with the exception of trench filling in the eastern quarter of the site. A total of five trenches 10-15 feet deep, the width of a truck and 30 feet long, were excavated in this area. Paper refuse was reportedly dumped in these trenches and burned. landfill had no borrow source but obtained sandy soil for daily cover from the gravel pit to the north, an excavated pond to the west, and essentially anywhere around the perimeter of the site where sand was available. It was reported that essentially two-thirds of the waste present in the dump was calcium sulfate from Miles Laboratories. As much as 360 tons/day were dumped over an unknown time duration. Other wastes accepted at the landfill included demolition/construction debris, industrial and hospital wastes, and to a minor degree, general household refuse. In 1976, the landfill was closed and covered. The cover was constructed of approximately one foot of sand overlying six inches of calcium sulfate.

In 1971, the Indiana State Board of Health (ISBH) first identified the Himco site as an open dump. In early 1974, residents nearby the Himco Dump complained to the ISBH about color, taste, and odor problems with their shallow wells.

Mr. Himes was advised by ISBH to replace six shallow water wells for residences immediately south of the landfill on County Road 10. Analyses of these wells by the state showed high levels of manganese. The old wells were finished at depths of approximately 22 feet, and the new wells were finished at depths ranging from 152 to 172 feet below ground surface. Well logs indicate that these wells were finished below a clay confining layer.







SOURCE: USGS 7.5 MIN. QUAD ELKHART, INDIANA, 1961 PHOTOREVISED 1981

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SITE LOCATION MAP

FEBRUARY, 1990

HIMCO DUMP SITE
STS ELKHART COUNTY, INDIANA

FIGURE 2-1

Engineers • Architects • Scientists

Himco Dump RI/FS Final Work Plan

Section No.: 2.0 Revision No.: 0 EPA Contract No. 68-W8-0093 Date: July 1990

In 1975, Mr. Himes signed a consent agreement with the ISBH Stream Pollution Control Board to close the dump by September of 1976. The final cover consisted of calcium sulfate overlain by sand.

In October of 1981, the United States Geological Survey (USGS), in cooperation with the Indiana Department of Natural Resources and the Elkhart Water Works reported on a three year study involving the "Hydrologic and Chemical Evaluation of the Groundwater Resources of Northwest Elkhart County, Indiana (USGS Report WRI/NTIS-81-53).

Data collected on the groundwater regime included the thickness and areal extent of unconsolidated deposits, their hydraulic conductivity, specific yield, transmissivity, and storage coefficients. The general groundwater flow patterns and stream-aquifer connections were also defined. The USGS report determined the horizontal and vertical extent of a potential leachate plume from the Himco Dump using concentrations of bromide in the groundwater. bromide concentrations in groundwater have been monitored from 1979 until present as shown in Appendix E.

In 1984, U.S. EPA field investigation team (FIT), as part of the HRS scoring package, conducted a site inspection at the Himco Dump. Laboratory analyses of wells sampled showed that the groundwater down gradient of the site was impacted by metals and semi-volatile and volatile organic compounds. The metals detected included aluminum, arsenic, barium, chromium, cobalt, selenium, beryllium, cadmium, copper, zinc, manganese, lead, nickel, and mercury. The volatile and semivolatile organic compounds detected included: acetone, benzene, phenol, freons, 4-methylphenol, trans 1,2-dichloroethane, 2-butanone, chloroethane, and pyrene. At the time of the site inspections, leachate seeps were observed. The results of the FIT analyses of the USGS wells are included in Appendix E.

In June 1988, the Himco Dump was proposed for the NPL and February 1990, was designated a final NPL site.

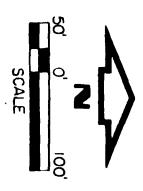
As of January 1990, the parcels of land which comprise the landfill are owned by the following individuals or corporations (as shown on Plan Sheet 1):

- I. Miles Laboratories
- II. CLD Corporation
- III. Alonzo Craft, Jr.
- IV. Indiana and Michigan Electric Co.

2.1.3 Current Conditions

Site features and existing monitoring wells are shown in Figure 2-2.

Donohue conducted a site visit on November 9, 1989 to the Himco Dump with representatives of the Indiana Department of Environmental Management (IDEM) and Charles Himes, Jr. the former operator of the site. The purpose of the site visit was to observe obvious surficial areas of environmental concern



Project No. 20026
File No.

PARCEL OWNERSHIP

HIMCO DUMP SITE ELKHART COUNTY, INDIANA

Himco Dump RI/FS Final Work Plan EPA Contract No. 68-W8-0093

(e.g., stressed vegetation, stained soils, and uncontrolled dumping), determine site access points for field operations, and inspect the final cover for uncovered refuse and surface water drainage patterns.

Section No.: 2.0

Revision No.: 0

Date: July 1990

During the site visit the final cover of sand overlying calcium sulfate was observed. The thickness of sand across the site was observed to be 0-1 feet thick. The thickness of the calcium sulfate layer is unknown. The western half of the dump was used as cropland (for soybeans) up to one year ago, but farming on the site has since ceased. The eastern half of the site is covered by grassland with some tree stands. There is an access road (made of sand) into the site near the intersection of County 10 and Nappanee Street. There is an abandoned gravel pit operation in the northeast corner of the site. A truck scale, concrete structures, and a utility pole are in this area. The gravel pit itself is filled with water, and a steep drop-off was observed. Some minor dumping into the gravel pit pond was noted. Another pond exists in the southwest corner of the site. It was reported that the owner of the property excavated this area to create a "fishing hole" which was then stocked with fish. It is not known if any biota still exist in this pond, but this pond is not believed to be maintained as a fishing hole.

Surface water drainage across the Himco Dump site is probably radial due to the configuration of the landfill. The highest point of the landfill is probably near its geographic center at a reported height of 15 feet above ground surface sloping to a height of 0-5 feet around the dump's perimeter. Erosional areas were noted around the site, some of them penetrating the calcium sulfate layer. Paper and plastic refuse also lay uncovered in certain areas. There were also deep caverns noted in areas that were initially created by burrowing rodents. Wildlife observed at the site included a four-point buck and various species of birds.

On-site and off-site monitoring wells installed by the USGS were also inspected by Donohue during the site visit. The wells were constructed of two-inch and four-inch ID PVC and had no protective casings. All wells checked had water in them, and these water levels were recorded. These wells were reported to have been constructed in the early 1980s. Construction documentation for the USGS wells is included in Appendix E.

An initial walk-through of the site was conducted with atmospheric monitoring equipment (an HNu, Lumidor, and geiger counter). Compounds monitored included: volatile organic compounds (VOCs), hydrogen sulfide, methane, X and gamma radiation. No readings above background were detected on any of the instruments. However, olfactory detection of "landfill gas" did occur intermittently across the dump site.

Section No.: 2.0 Revision No.: 0 EPA Contract No. 68-W8-0093 Date: July 1990

2.2 PHYSICAL AND CULTURAL SETTING

2.2.1 Geology

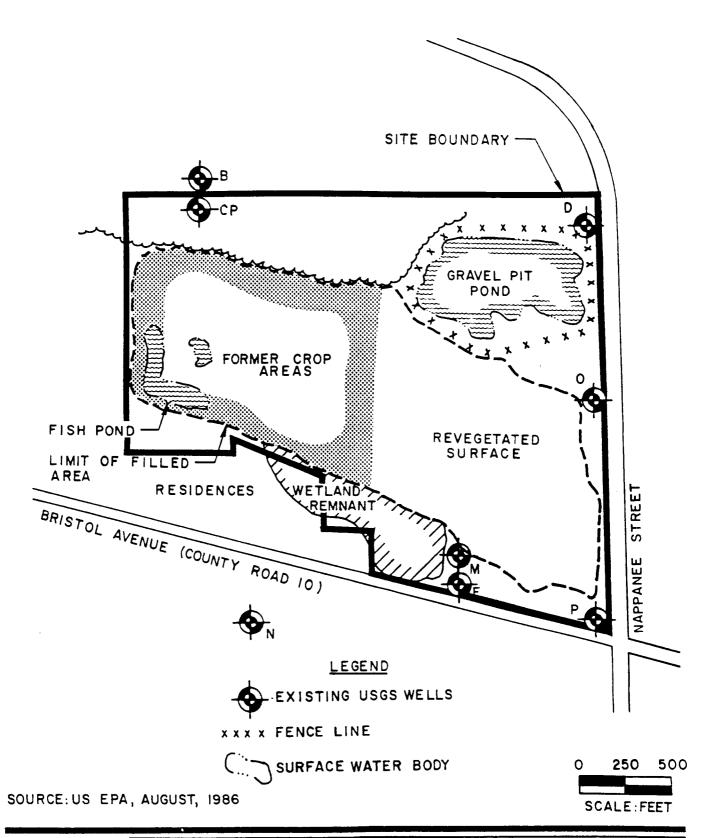
The following discussion of geology is divided into two sections. The first describes the regional geology of Northern Indiana and Elkhart County. The second describes the site geology of the immediate area of the Himco Dump. Each section includes descriptions of Cenozoic, Paleozoic, and Precambrian age units.

2.2.1.1 Regional Geology

The regional geology of Northern Indiana and Elkhart County consists of Cenozoic age glacial deposits, overlying Paleozoic sedimentary rocks overlying Precambrian basement rock. Structurally this area is considered part of the Michigan basin. Cenozoic deposits found in the region were deposited during the Wisconsinan glaciation of the Pleistocene Epoch. As the glacial ice receded, the fast-flowing waters deposited layers of sand and gravel, and the slower moving and standing water deposited silts and clays. These are known as valley train outwash deposits. The thickness of these deposits ranges from 85 to 500 feet. The silt and clay layer, where present, has a maximum thickness of 80 feet and an average thickness of 20 feet. The bedrock topography was also modified by continental glaciation. The bedrock topography in Elkhart County varies from approximately 300 feet mean sea level (MSL) to 600 feet MSL. A bedrock valley trending northeast - southwest occurs underneath the ELkhart Municipal Airport and Himco Dump, north to Christiana Lake (Cass County, Michigan), and south to the St. Joseph River (Figure 2-3). The thickest portion of the outwash deposits occurs in this bedrock valley.

The Paleozoic units consist of the Coldwater Shale of Mississippian age and the Sunbury and the Ellsworth shales of Devonian and Mississippian age (USGS, 1981) (Figure 2-4). These formation do not crop out in Elkhart County. The Coldwater Formation of Mississippian age is typically a gray to greenish gray, slightly silty shale. In some places there are lenses of brown dolomite or limestone throughout the section. In Stueben County (Northeastern Indiana), the formation reaches a thickness of greater than 500 feet. A distinctive red shale, 5 to 20 feet thick and sometimes called the Coldwater Red Rock is at the base of the unit. The Coldwater conformably overlies the Sunbury and Ellsworth Shales (Indiana Department of Natural Resources, Geological Survey, Bulletin 59, 1986).

The Sunbury Shale of Mississippian age is a carbonaceous brownish black shale, which lies stratigraphically between the Ellsworth and Coldwater Shales. Sunbury is slightly greater than 10 feet thick in Stueben County, and thins southward and westward. The formation is absent west of LaGrange County. The Ellsworth Shale consists of alternating beds of gray-green shale and brownishblack shale in the lower part, and grayish-green shale bearing light-greenish limestone or dolomite in the upper parts of the formation (IDNR Geological Survey, 1986). The formation consists predominantly of greenish gray shale. The thickness of the Ellsworth ranges from less than 40 feet in northern DeKalb County to more than 200 feet in LaGrange County.



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EXISTING SITE FEATURES

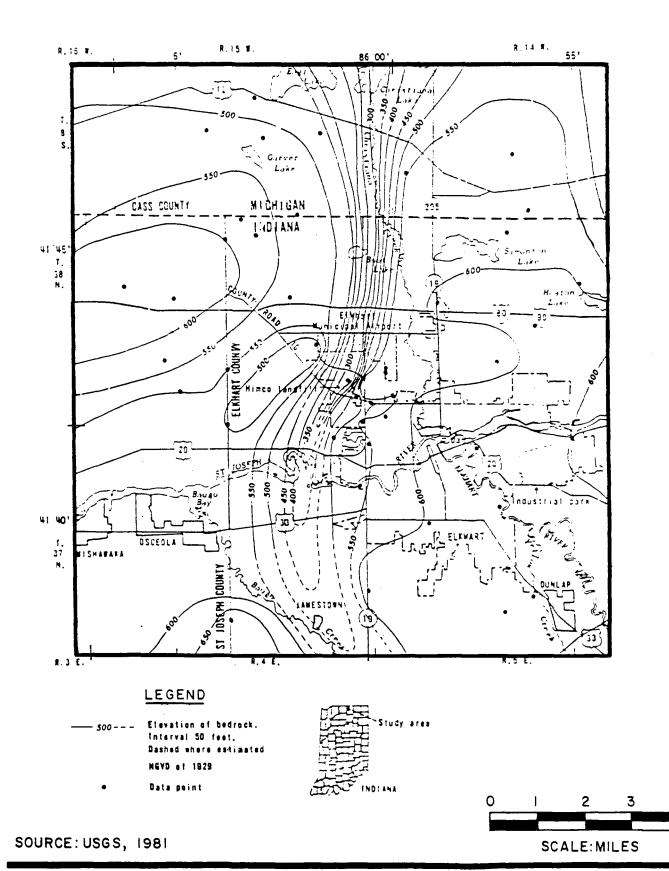
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HIMCO DUMP SITE ELKHART COUNTY, INDIANA



FIGURE 2-2

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BEDROCK TOPOGRAPHY IN PARTS OF ELKHART AND ST. JOSEPH COUNTIES, INDIANA

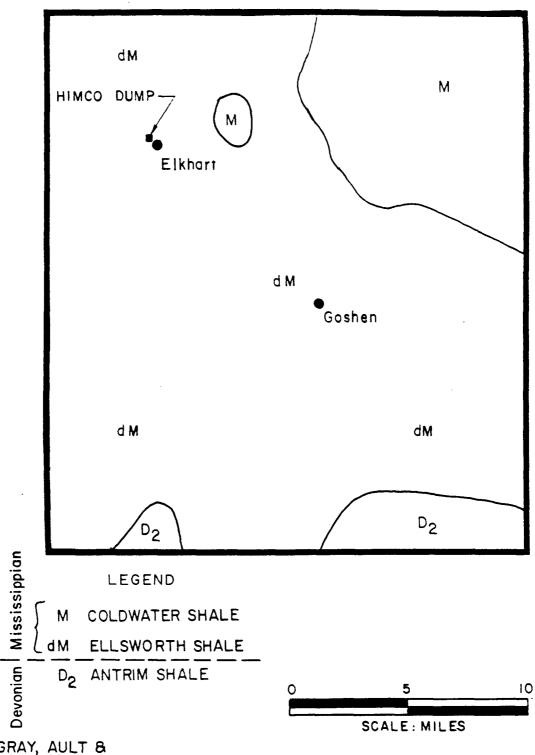


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HIMCO DUMP SITE ELKHART COUNTY, INDIANA

FIGURE

2-3



SOURCE: GRAY, AULT & KELLER, 1987

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PALEOZOIC GEOLOGY OF ELKHART, INDIANA

HIMCO DUMP SITE ELKHART COUNTY, INDIANA



FIGURE

Section No.: 2.0 Revision No.: 0 EPA Contract No. 68-W8-0093 Date: July 1990

Precambrian basement rock occurs below these thick sequences of Paleozoic sedimentary rock. Based on limited deep borehole information, the rock mass is predominantly granite, including some metasedimentary and basaltic rocks (Gray, Ault, and Keller, 1987).

2.2.1.2 Site Geology

The following discussion of the geology at the Himco Dump site is based upon data from 35 USGS borings at depths ranging from 20 to 489 feet MSL, and interpretations based on regional geological information. The borings that were advanced by the USGS were part of a three-year hydrogeological study of Northwest Elkhart County, Indiana. The thickness and areal extent of the unconsolidated Pleistocene deposits were determined from lithologic logs and from natural gamma radiation logs of the 35 test borings. Boring logs from the USGS wells are included in Appendix E.

The unconsolidated deposits below the Himco Dump consist of sand and gravel valley train outwash deposits, interbedded with silt and clay. These deposits range in thickness from 85 to 500 feet, with an average thickness of 175 feet. Beneath the Himco Dump site, the silt and clay layer is absent. A geologic cross-section through the Himco Dump and Northwest Elkhart County is presented in Figure 2-5.

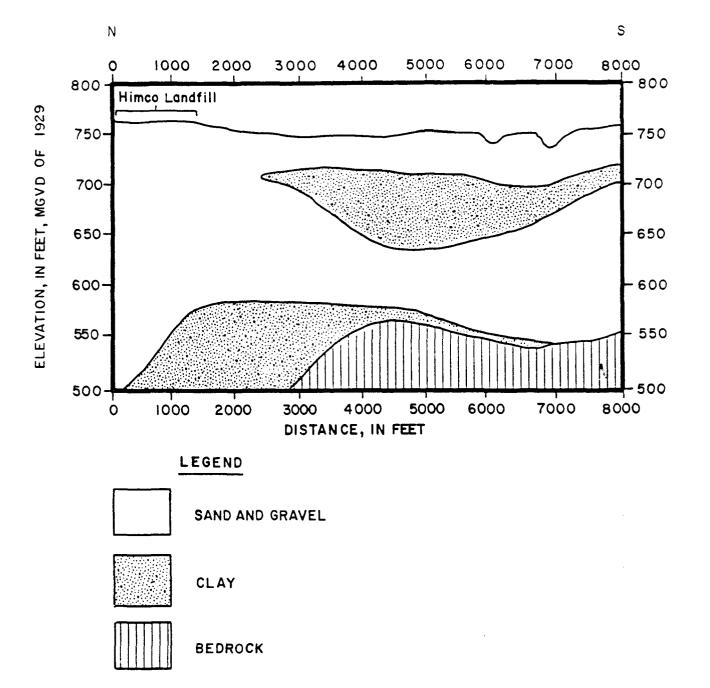
Underlying the unconsolidated outwash deposits are the Coldwater and Ellsworth Shale of Mississippian Age. A bedrock valley trending northeast-southwest occurs directly below the Himco Dump site (Figure 2-3). Depth to bedrock in the vicinity of the site ranges from 174 to 489 feet below ground surface. The thickness of the Coldwater and Ellsworth Shale beneath the site is unknown. However regional stratigraphic information suggests that thickness of the formations to be approximately 200 and 500 feet, respectively (IDNR, Geological Survey, 1986).

2.2.2 Surficial Soils

Soils present on the Himco Dump site include the Tawas Muck and Plainfield Fine Sand, and to a lesser degree the Tyner Loamy Sand, Gilford Sandy Loam, and Oshtemo Loamy Sand (U.S. Department of Agriculture, Soil Conservation Service, 1989).

The Tawas Muck is described as dark-colored, mucky in texture, and present on depressional upland. It is deep and very poorly drained with rapid permeability. It has high available water for plant growth and a very high organic matter content.

The Plainfield Fine Sand is described as having 2 to 6 percent slopes, dark color, sandy in texture, and present on sloping uplands. It is deep and excessively drained with a rapid permeability. It has low available water for plant growth and a very high organic matter content.



SOURCE: USGS, OCTOBER, 1981

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GEOLOGIC CROSS—SECTION THROUGH
HIMCO DUMP & NORTHWEST ELKHART COUNTY

20026

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HIMCO DUMP SITE ELKHART COUNTY, INDIANA

FIGURE 2-5

Himco Dump RI/FS Final Work Plan

Revision No.: 0 EPA Contract No. 68-W8-0093 Date: July 1990

Section No.: 2.0

The Tyner Loamy Sand (0 to 2 percent slopes) is dark colored, sandy in texture, and on sloping uplands. It is deep and somewhat excessively drained with rapid permeability. It has low available water for plant growth and a low organic matter content.

The Gilford Sandy Loam is dark colored, loamy in texture, and on depressional uplands. It is deep and very poorly drained with rapid permeability. It has moderate available water for plant growth and a high organic matter content.

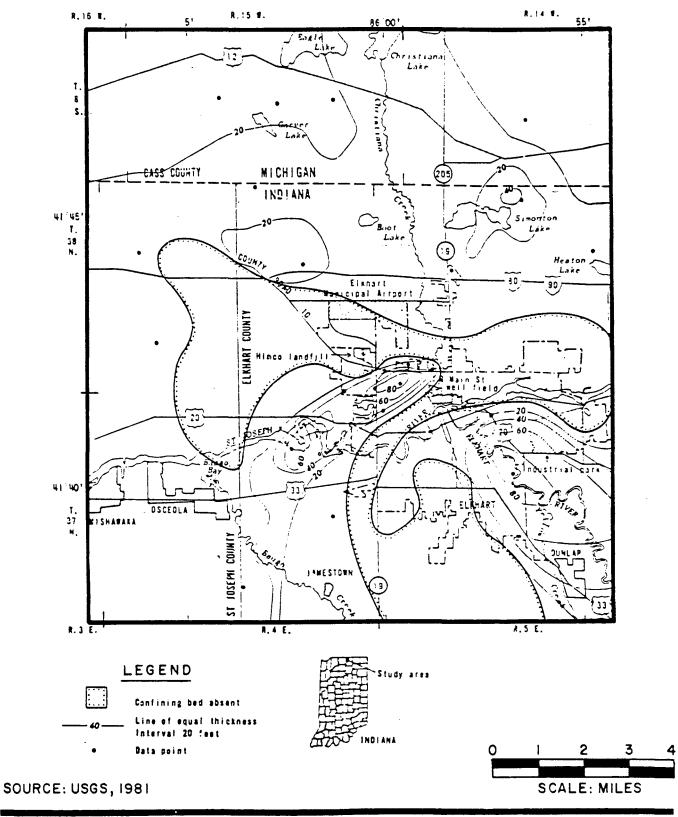
The Oshtemo Loamy Sand (0 to 2% slopes) is a dark colored, sandy soil, present on sloping uplands. It is deep and somewhat excessively drained with rapid permeability. It has low available water for plant growth and a low organic matter content. The soil has gravelly sand starting at a depth between 40 to 60 inches.

2.2.3 Groundwater Hydrology

2.2.3.1 Regional Hydrogeology

The Elkhart County area is underlain by an areally extensive, thick outwash aquifer composed of sand and gravel, in some parts of the area, there is a silt and clay layer which acts as an aquitard. This confining layer, where present, divides the outwash aquifer into an upper unconfined aquifer and a lower confined aquifer. The extent of the confining layer in the vicinity of the Himco Dump is shown in Figure 2-6. The Paleozoic rocks (principally shales) below the outwash aquifers generally act as aquicludes and are not used as a source of groundwater. According to the Indiana Geological Survey Division of Water, it is very rare to have wells screened in the bedrock and there are no records of any high capacity wells in these formations near the Himco Dump.

The saturated thickness of the outwash aquifer ranges from 40 feet in the vicinity of the North Main Street well field to more than 450 feet in the preglacial bedrock valley. The average hydraulic conductivities calculated for sand and for sand and gravel, were 80 and 400 ft/day, respectively (USGS, 1981). The lateral hydraulic conductivity of the silt and clay aquitard is approximately 0.1 ft/day, based on average hydraulic conductivities of silt and clay (Freeze and Cherry, 1979). The calculated transmissivities for the unconfined aquifer ranged from 4,000 ft²/day to 175,000 ft²/day in the bedrock valley near the Himco Dump. Transmissivities for the confined aquifer ranged from 5,000 ft^2/day to 85,000 ft^2/day (USGS, 1981). Specific yield of 0.16 for the unconfined aquifer and a storage coefficient of 0.00006 for the confined aquifer have been calculated (Marie, 1975). A potentiometric map of the groundwater flow in the unconfined aquifer in the vicinity of Himco Dump is presented in Figure 2-7. Groundwater flow is generally horizontal and towards the St. Joseph River. This is a flow pattern characteristic of a gaining stream in a well connected stream - aquifer system. Water levels in the aquifer fluctuate from 2 to 4 ft/yr. Water levels are highest in late March and April, and lowest in September and October (USGS, 1981). Groundwater pumpage in this aquifer is greatest in the City of Elkhart. The North Main



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THICKNESS AND EXTENT OF CLAY CONFINING LAYER

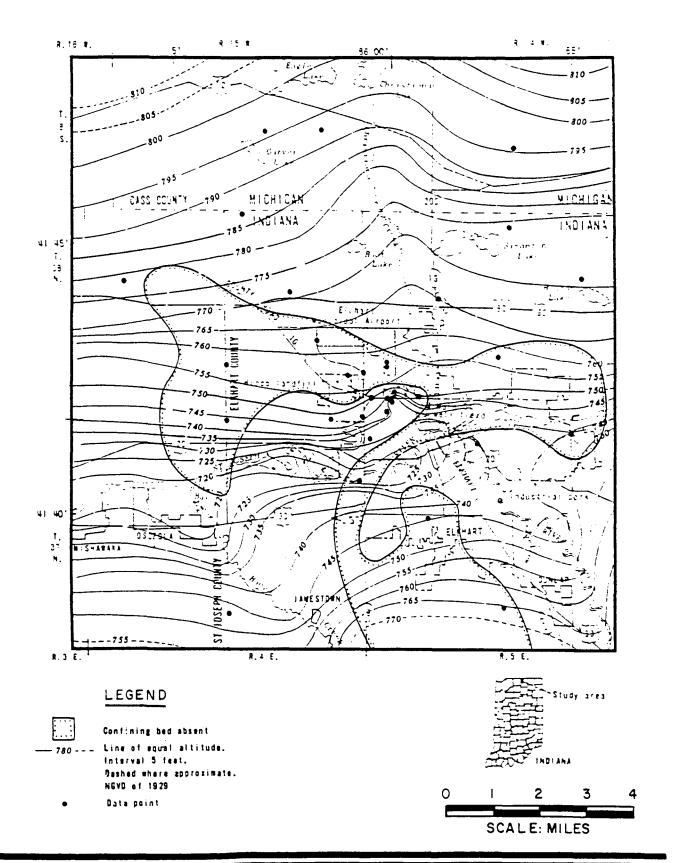


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20026

. HIMCO DUMP SITE ELKHART COUNTY, INDIANA

FIGURE 2-6



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POTENTIOMETRIC MAP OF CONFINED AQUIFER

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HIMCO DUMP SITE ELKHART COUNTY, INDIANA

FIGURE 2-7

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Himco Dump RI/FS Final Work Plan

Section No.: 2.0 Revision No.: 0 Date: July 1990 EPA Contract No. 68-W8-0093

Street well field has fifteen production wells supplying approximately 4 to 10 million gallons per day, which constitutes approximately 70 percent of the well field capacity.

The water quality of the outwash aquifer is suitable for most uses and has median concentrations of 440 mg/l total dissolved solids; 286 mg/l hardness (as calcium carbonate); iron, 900 ug/l; nitrate (as nitrogen), 0.01 mg/l; and chloride 10 mg/l.

2.2.3.2 Site-Specific Hydrogeology

In 1977, the USGS installed a network of groundwater monitoring wells around the Himco Dump site and Northwest Elkhart County. Sixteen well nests (some sites consisting of two or more wells) were constructed within a one-mile radius of the Himco Dump site. The well nests were installed upgradient, downgradient, and sidegradient to the dump site. The landfill wells' (as designated by USGS) locations and designations are presented in Figure 2-2. The landfill wells were sampled by the USGS in April-May and October of 1978, and in April-May and September of 1979. Nine monitoring wells were sampled by the Ecology & Environment FIT team, under the auspices of the EPA, in 1984. Heavy metals and volatile organic compounds have been detected in some of the landfill wells. Well depths for the study ranged from 14 to 200 feet below ground surface. All wells were screened in sand or sand and gravel. Bromide concentrations have also been monitored by the USGS to the present, to determine the movement of a leachate plume originating at the Himco Dump. Isopach maps showing the movement of the bromide plume over time are included in Appendix E.

According to U.S.G.S., groundwater occurs around the site at depths ranging from 8 to 17 feet. The outwash aguifer is unconfined below the Himco site, and the silt and clay confining layer is absent. Groundwater flow is generally horizontal towards the south-southeast to the St. Joseph River, a groundwater discharge area. The saturated thickness of the aquifer below the site in the vicinity of the bedrock valley is approximately 450 feet. Hydraulic conductivities for the wells were estimated based on specific capacity tests and not by in-field hydraulic conductivity testing. The average values of hydraulic conductivity calculated for sand, and for sand and gravel, were 80 and 400 ft/day, respectively (USGS, 1981). No laboratory hydraulic conductivity tests were performed. In addition, U.S.G.S. did not place borings in the landfill itself.

2.2.4 Regional and Site Topography

The Himco Dump is located in Elkhart County, Indiana. Elkhart County lies in the Great Lakes section of the Central Lowlands Physiographic Province. The present topography is a result of continental glaciation.

Himco Dump RI/FS
Final Work Plan
EPA Contract No. 68-W8-0093

Section No.: 2.0
Revision No.: 0
Date: July 1990

The land surface consists of nearly level and gently sloping eolian and outwash sands in the northern part of the county; level to moderately sloping outwash terraces and plains in the northern and central portions of the county; and nearly level to strongly sloping glacial till plains in the eastern and western portions (Kirchner and McCarter, 1974).

The land surface elevation in Elkhart County ranges from 950 feet in the southeast to 740 feet MSL in the west at the St. Joseph River (USGS, 1981).

2.2.5 Surface Water

The Himco Dump is located in the St. Joseph River basin. The river is approximately two miles south of the site. The St. Joseph River flows from east to west in this area, and all surface drainage flows to the river or its tributaries. Ultimately the St. Joseph River empties into Lake Michigan at St. Joseph, Michigan.

There are three surface water bodies present on the Himco Dump site. There is a gravel pit pond in the northeast corner of the site, and two excavated ponds located in the southwest corner of the site. One of these ponds is reportedly stocked with fish.

2.2.6 Climate

Elkhart County has a typical mid-continental climate with a large temperature variation between winter and summer. The average monthly temperatures in Elkhart County range from $23^{\circ}F$ in January to $72^{\circ}F$ in July. The temperature extremes are from $10^{\circ}F$ to $98^{\circ}F$. The mean annual rainfall is 34.5 inches and the mean annual snowfall is approximately 36 inches. Snowfall usually occurs between November and March (Purdue University, 1985).

2.2.7 Population and Land Use

The population of the City of Elkhart is approximately 40,000. The City has an area of approximately 17 square miles. Within a one-mile radius of the Himco Dump site, land use is residential, commercial, industrial, and agricultural. Approximately one-third of the site itself has been used for soybean production. Corn is also grown in the area. Historical use of the herbicides Alachlor and Atrazine and the pesticide Furadan, occurs in the area according to the Elkhart County Purdue Extension Agricultural Agent. These compounds degrade completely within 14 months. Analysis of site samples for these pesticides and herbicides will not occur during the RI as their presence would be due to agricultural and not waste disposal practices.

3.0 INITIAL EVALUATION

Section No.: 3.0

Revision No.: 0

Date: July 1990

3.1 TYPES AND VOLUMES OF WASTE PRESENT

According to Chuck Himes, principal landfill operator, there was no liner, and no leachate, or gas recovery systems constructed for the landfill. Essentially two-thirds of the waste present in the dump was calcium sulfate sludge. As much as 360 tons per day were dumped over an unknown time duration. In 1976, Miles Laboratories provided the Indiana State Board of Health (ISBH) with a list of industrial pharmaceutical wastes disposed of at Himco Dump. The list included calcium sulfate, and sodium and potassium bromide compounds.

Other wastes accepted at the landfill included demolition/construction debris, industrial and hospital wastes, and general household refuse. Initially, the area was marsh and grassland. Refuse was placed at ground surface across the site with the exception of trench filling in the eastern quarter of the site. A total of five trenches 10 to 15 feet deep, a truck width wide and 30 feet long, were excavated in this area. Paper refuse was dumped in these trenches and burned. The landfill cover consists of approximately one foot of sand overlying six inches of calcium sulfate.

In 1984, a FIT team conducted a site inspection at Himco Dump. Laboratory analysis of wells showed that the groundwater was impacted by metals, a semi-volatile and volatile organic compounds.

Other potentially responsible parties (PRPs) indicated that wastes possibly disposed of at Himco Dump include solvents, ink, water-based adhesives, degreaser sludge, and waste oil.

3.2 POTENTIAL CONTAMINANT MIGRATION PATHWAYS AND PRELIMINARY PUBLIC HEALTH AND ENVIRONMENTAL IMPACTS

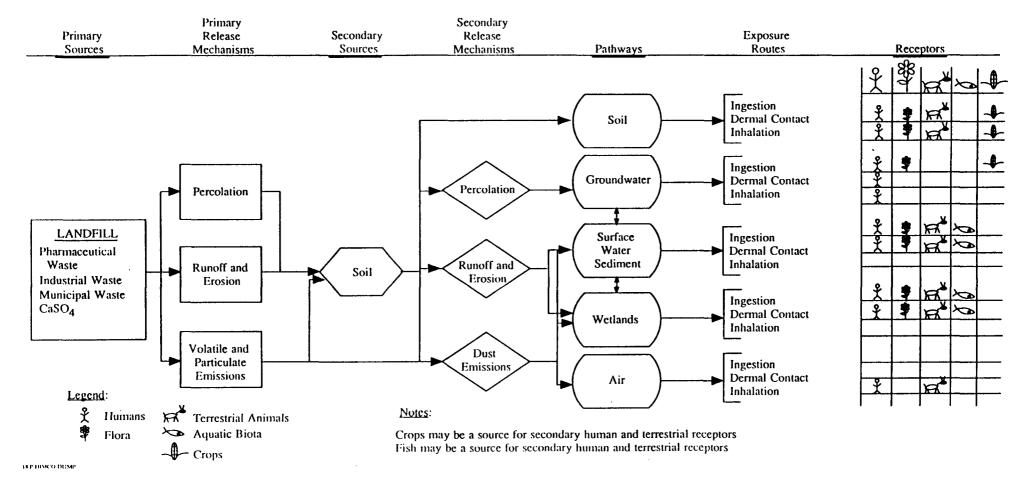
The sources and potential pathways of contaminant migration are shown on Figure 3-1, the Conceptual Site Model. The primary suspected contaminant source is the landfill which is known to contain pharmaceutical waste, industrial waste, municipal waste, and calcium sulfate.

Primary release mechanisms include particulate and volatile emissions, percolation, runoff, and erosion. These release mechanisms result in a secondary contaminant source which includes soil under and surrounding the landfill.

Secondary release mechanisms include percolation which results in potential contamination of groundwater, sediment, surface water, and wetlands. The secondary release mechanisms of runoff and erosion may contaminate surface water, sediment, and wetlands. Contamination of surface water, sediment, wetlands, and air could also arise from the secondary release mechanism of dust emissions. Potential contaminant transport pathways to receptors include air, groundwater, sediment, surface water, and wetlands.

FIGURE 3–1 CONCEPTUAL SITE MODEL

Himco Dump Elkhart, Indiana



Section No.: 3.0
Revision No.: 0
Date: July 1990

Primary receptors include humans through direct contact, ingestion, inhalation, and dermal contact, and terrestrial and aquatic environmental species through direct contact, ingestion, inhalation, and dermal contact. Crops grown on the landfill cap could serve as a receptor through uptake (ingestion) of contaminated groundwater and surface water. Human and terrestrial receptors could then be exposed through crop ingestion and dermal contact.

3.3 PRELIMINARY IDENTIFICATION OF REMEDIAL RESPONSE OBJECTIVES AND GENERAL RESPONSE ACTIONS

Preliminary remedial response objectives and general response actions were identified for each medium at the Himco Dump Site to mitigate risks to public health and the environment. The preliminary remedial action objectives, the general response actions, and associated potential remedial technology types are summarized in Table 3-1. After data have been gathered and evaluated, the preliminary response objectives will be refined and further developed or, as appropriate, will be eliminated. The remedial technologies will also be reviewed and developed. Newly recognized remedial technologies and processes may be added to provide a broader base from which to select remedies. The technologies and processes that are determined to be inappropriate for the Himco Dump Site will be eliminated. A preliminary screening of technologies and process options is given in Appendix A.

The media that may be potentially evaluated for remediation at the Himco Dump Site are soil, groundwater, leachate, surface water and sediment, and landfill gas. Evaluation of the nature and extent of potential groundwater contamination with the aquifer units is not addressed in this investigation, but rather in the Remedial Design Investigation.

Human health remedial action objectives for soil are to prevent ingestion, direct contact with, or inhalation of soil, and bioaccumulation of toxic compounds that would result in exposure to toxic doses of contaminants or cancer risks greater than the range of 10^{-4} to 10^{-6} . Environmental objectives include preventing migration of contaminants that would result in excess of maximum contaminant limit (MCLs) and water quality levels. The general response actions include: (1) the no-action alternative, (2) institutional controls, (3) containment, (4) treatment, and (5) removal and disposal.

Human health remedial action objectives for groundwater and leachate are to prevent ingestion of groundwater or having contaminant concentrations in excess of MCL values and a total excess cancer risk greater than the range of 10^{-4} to 10^{-6} , since there are public water supply wells in the area. In addition, water quality criteria must be met for toxicity and carcinogenicity to humans via ingestion and for protection of aquatic species. Remedial action objectives related to environmental protection include restoring the groundwater aquifer to concentrations below the acceptable risk or MCLs in a reasonable period of time. The general response actions include: (1) the no-action alternative, (2) institutional controls, (3) containment, (4) extraction, (5) groundwater or leachate treatment, and (6) disposal. Collection and treatment options include external and in-situ treatment.

PRELIMINARY IDENTIFICATION OF REMEDIAL ACTION OBJECTIVES, GENERAL RESPONSE ACTIONS, AND TECHNOLOGY TYPES HIMCO DUMP RI/FS Elkhart County, Indiana

Environmental Media	Remedial Action Objectives	General Response Actions	Remedial Technology Types	Process Options
Soil	For Human Health:	No Action: - No action	No Action Options:	No Action Options: - None
	Prevent ingestion/direct contact/inhalation with soil containing non-carcinogens in excess of reference doses.	<u>Institutional Controls:</u> - Access restrictions - Monitoring and analysis	Institutional Controls: - Access restrictions - Monitoring and analysis	Institutional Control Options: - Deed restrictions - Fencing - Groundwater monitoring
	Prevent direct contact, ingestion, or inhalation of soil having 10^{-4} to 10^{-6} excess cancer risk from carcinogens.	Containment Actions: - Containment	Containment Technologies: - Capping - Dust Controls - Surface Control - Erosion Control	Containment Process Options: - Non-RCRA cap - RCRA cap - Sprinkling - Grading - Revegetation capping
	For Environmental Protection: Prevent migration of contaminants that would result in groundwater contamination in excess of MCLs and watet quality criteria.	Removal/Treatment Actions: - In-situ treatment - Removal/treatment/disposal - Removal/disposal	Treatment Technologies: - Treatment not applicable to this site. Refer to Appendix for table showing initial screening of technologies and process options.	- Revegeration capping
			Removal and Disposal Technologies: - Not applicable to this site. Refer to Appendix for table showing initial screening of technologies	
Groundwater	For Human Health: Prevent ingestion of water having carcinogens in excess	No Action: - No action	No Action Technologies: - None	No Action Options: - Not applicable
	of MCLs and a total cancer risk of greater than 10^{-4} to 10^{-6} .	Institutional Actions: - Access restrictions - Monitoring and analyses - Alternate residential water supply.	Institutional Controls: - Access restrictions - Monitoring and analyses	Institutional Control Options: - Deed restrictions - Fencing - City water supply - New Community well water - Groundwater monitoring
	Prevent ingestion of water having carcinogens in excess of MCLs or reference doses.	<u>Containment Actions:</u> - Containment	Containment Technologies: - Vertical barriers - Hydraulic barrier	Containment Process Options: - Partial slurry wall tied into clay layer south of site - Groundwater pumping

PRELIMINARY IDENTIFICATION OF REMEDIAL ACTION OBJECTIVES, GENERAL RESPONSE ACTIONS, AND TECHNOLOGY TYPES

HIMCO DUMP RI/FS Elkhart County, Indiana (Continued)

Environmental Media	Remedial Action Objectives	General Response Actions	Remedial Technology Types	Process Options
Groundwater (Continued)	For Environmental Protection: Restore groundwater aquifer to MCLs and ambient water quality criteria.	Removal/Treatment Actions: - Collection/treatment/ discharge - On-site groundwater treatment - In-situ groundwater treatment	Extraction Technology Types: Groundwater collection pumping	Extraction Process Options: - Wells
			Treatment Technologies: - Physical/chemical treatment - Biological treatment (organics) - In-situ treatment	Physical/Chemical Treatment: - Air stripping - Carbon adsorption - Chemical oxidation/reduction - Photo/chemical oxidation - Precipitation - Steam Stripping - Ion exchange - Blending
		Effluent Discharge Actions: - Disposal	Disposal Technologies: -After treatment -Prior to treatment	Biological Treatment: - Aerobic - Anaerobic - Land treatment - In-situ biological treatment - Activated Sludge/Powdered activated carbon treatment Disposal Options - Discharge to POTW (after treatment) - Discharge to surface water (after treatment) - Reinjection - Agricultural/Industrial use - Seepage basin - Subsurface drains - Temporary Storage
Surface Water and Sediment	For Human Health: Prevent ingestion/direct contact/inhalation with surface water or sediment having carcinogens in excess of MCLs and a total cancer risk of grater than 10 ⁻⁴ to 10 ⁻⁶ .	No Action: - No action Institutional Controls: - Acess restrictions - Sampling	No Action Options: - None Institutional Controls: - Acess restrictions - Sampling	No Action Options: - None Institutional Control Options: - Deed restrictions - Fencing - Surface water collection and sampling
	Prevent ingestion/direct contact/inhalation with surface water or sediment containing non-carcinogens in excess of MCL's or reference doses.	Surface Water Collection/ Treatment Actions: - Surface water runoff interception	Surface Water Collection Technologies: - Sediment control barriers	Collection Options: - Dikes and berms - Silt fences

PRELIMINARY IDENTIFICATION OF REMEDIAL ACTION OBJECTIVES, GENERAL RESPONSE ACTIONS, AND TECHNOLOGY TYPES HIMCO DUMP RI/FS

Elkhart County, Indiana (Continued)

Environmental Media	Remedial Action Objectives	General Response Actions	Remedial Technology Types	Process Options
Surface Water and Sediment (Continued)	For Environmental Protection: Prevent releases of contaminants from sediments that would result in surface water levels in excess of ambient water quality criteria.	- Surface water treatment/ discharge	Surface Water Treatment Technologies: - Physical/chemical treatment - Biological treatment	Physical/Chemical Treatment Options:
				Biological Treatment Options: - Aerobic - Anaerobic - Land treatment - Activated Sludge/Powdered activated carbon treatment.
	Restore surface water to ambient water quality criteria.	Surface Water Discharge Actions: - Disposal	Surface Water Disposal Technologies: - After treatment - Prior to treatment	Disposal Options: - Discharge to POTW (after treatment) - Return to surface water (after treatment) - Agricultural/Industrial use - Discharge to POTW (prior to treatment) - Temporary Storage
		Sediment Excavation/ Treatment Actions: - Removal/disposal - Removal/treatment/ disposal	Sediment Removal Technologies: - Excavation	Removal Options: - Sediment excavation
			Sediment Treatment Technologies: Thermal treatment Physical/chemical treatment Solidfication/ stabilization Biological treatment	Sediment Thermal Treatment Options: - Rotary kiln - Infared thermal treatment - Circulating fluidized bed - Pyrolysis

PRELIMINARY IDENTIFICATION OF REMEDIAL ACTION OBJECTIVES, GENERAL RESPONSE ACTIONS, AND TECHNOLOGY TYPES HIMCO DUMP RI/FS

Elkhart County, Indiana (Continued)

Environmental Media	Remedial Action Objectives	General Response Actions	Remedial Technology Types	Process Options
Surface Water and Sediment (Continued)				Sediment Physical/ Chemical Treatment Options: - Soil washing - Solvent Extraction - Dehalogenation - Devatering - Low temperature thermal destruction
				Sediment Solidification/ Stabilization Treatment Options: - Vitrification
				Sediment Biological Treatment Options: - Aerobic - Anaerobic - Land treatment
			Sediment Disposal Technologies: - Disposal	Sediment Disposal Options: - Off-site secure landfill
Landfill Gas	For Human Health: Prevent inhalation of	No Action: - No action	No Action Options: - None	No Action Options: - Not applicable
	carcinogens in excess of 10^{-4} to 10^{-6} excess cancer risk.	Institutional Controls: - Access restrictions - Monitoring	Institutional Controls: - Access restrictions - Gas Monitoring	Institutional Control Options: - Deed restrictions - Site access limitations - Gas probes - Agricultural/Industrial
		<u>Collection Actions:</u> - Gas collection	Collection Technologies: - Landfill gas collection	- Agricultural/Industrial Collection Process Options: - Passive vents - Passive flares - Active gas collection systems

ARCS/P/HIMCO/AB6

Himco Dump RI/FS
Final Work Plan
EPA Contract No. 68-W8-0093

The response actions and associated remedial technology types listed in the table are the result of a preliminary screening of potentially applicable technologies. This preliminary screening is performed to focus from the onset

Section No.: 3.0

Revision No.: 0

Date: July 1990

Human health remedial action objectives for landfill gas are to prevent inhalation of carcinogens in excess of 10^{-4} to 10^{-6} excess cancer risk. The general response actions include: (1) the no-action alternative, (2) institutional controls, and (3) collection and flaring.

of the project on only those technologies that are potentially feasible. A

figure showing this screening is presented in Appendix A.

3.4 PRELIMINARY IDENTIFICATION OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) AND TO-BE-CONSIDERED REQUIREMENTS (TBCs)

ARARS, as defined by CERCLA, are (1) any standard, requirement, criterion, or limitation under any federal environmental law; and (2) any promulgated standard, requirement, criterion, or limitation under a state environmental or facility siting law that is more stringent than any federal standard, requirement, criterion, or limitation. ARARS that relate to the level of pollutant allowed are called chemical-specific; ARARS that relate to the presence of a special geographic or archaeologic area are called location-specific; and ARARS that relate to a method of remedial response are called action-specific.

To-be-considered requirements are non-promulgated criteria, advisories, and guidance which may be useful in evaluating risks or developing a remedial alternative when ARARs do not exist for a particular chemical or when the existing ARARs are not protective of human health or the environment.

3.4.1 Potential Applicable or Relevant and Appropriate Requirements

The National Contingency Plan (NCP) and CERCLA Compliance Policy define "applicable" requirements as federal requirements for hazardous substances that would be legally applicable at the site if this response were not undertaken under CERCLA Section 104. "Relevant and appropriate" requirements are those that, while not applicable, are designed to apply to problems similar to those encountered at this site. Requirements may be relevant and appropriate if they would be applicable except for jurisdictional restrictions associated with the requirement. In the selection of remedial alternatives, relevant and appropriate requirements are to be afforded the same weight and consideration as applicable requirements. Federal and State regulatory requirements preliminarily identified as being potentially applicable or relevant and appropriate will be reviewed and developed over the course of the RI/FS.

3.4.2 Potential To-Be-Considered Requirements

Other non-promulgated criteria, advisories, guidance, or proposed regulations (i.e., TBCs) may be useful in evaluating risks or developing a remedial alternative. Proposed federal and state regulations will be reviewed over the course of the project for their applicability in evaluating risks or developing remedial alternatives for the Himco Dump site.

4.0 WORK PLAN RATIONALE AND APPROACH

Section No.: 4.0

Revision No.: 0

Date: July 1990

The existing data base indicates that the primary potential contaminants associated with the Himco Dump site are heavy metals and semivolatile and volatile organic compounds. The potentially contaminated media on-site include soil, sediment, surface water, groundwater, leachate and landfill gas. Based on our initial evaluation (Section 3.0) and technical determinations reached at project scoping meetings, the primary objectives of the Himco Dump RI/FS are to:

- Characterize the nature and extent of contamination in the landfill site soils, sediment, surface water, groundwater, leachate and landfill gas. These media are potential contaminant sources or pathways.
- Determine the potential for contaminant transport from the landfill via air, groundwater, and sediment/surface water pathways.
- Conduct a baseline human health evaluation and an environmental evaluation as appropriate for the site.
- Identify and develop standards and criteria for contaminant cleanup.
- Evaluate a range of feasible, permanent solutions for on-site remediation in accordance with the Superfund Amendments and Reauthorization Act.

4.1 DATA QUALITY OBJECTIVES (DQOs)

Data Quality Objectives (DQOs) were developed by EPA based on the premise that different end-users of data necessitate varying levels of analytical data quality. EPA has defined five levels of analytical data quality: Level (1) field screening; Level (2) on-site analysis; Level (3) off-site analysis by EPA-approved method; Level (4) Contract Laboratory Program (CLP) Routine Analytical Services (RAS) analysis; and Level (5) Special Analytical Services (SAS) analysis.

Data collected during the Himco Dump RI/FS will be used to determine the nature and extent of contamination at the site (site and waste characterization), to establish the level of protection needed for investigators or workers at the site (health and safety), to evaluate the threat posed by the site to public health and the environment (risk assessment), and to evaluate remedial technologies (alternatives evaluation). Decision types and data needs are identified in the following paragraphs for each the media of interest. Data use analytical levels are specified as defined in <u>Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA</u>, Interim Final (OSWER Directive 9355.3-01, October 1988).

TABLE 4-I PRELIMINARY IDENTIFICATION OF DATA NEEDS ACCORDING TO RESPONSE ACTION/REMEDIAL TECHNOLOGY HIMCO DUMP RI/FS FI KHART COUNTY INDIANA

DATA NEEDS SITE CHARACTERISTICS STORAGE TIME ACCESSIBILITY LAND USE ECOLOGICAL AREAS VEGETATION TOPOGRAPHY DRAINGLOWNO NEEDS OF ACILITY LOCATIONATOR OF ACILITY OR USER QUALITY, VOLUME CLIMATE PRECIPITATION TEMPERATURE EVAPORATION WINC SPEED DIRECTION HYDROGELOGY DEFTH TO METAMEABLE STRATA SEISMIC HISTORY SUBSURFACE CHARACTERIZATION TRANSHISSIVITY, STORATIVITY DEFTH TO GROUNDWATER/LEACHATE RATE A DIRECTION OF FLOW HYDROGEL COV DETH TO GROUNDWATER/LEACHATE RATE A DIRECTION OF FLOW HYDROULIC CONDUCTIVITY DUBYING RATE TO CONTAIN PLUME LOCATIONS OF WELLS WELL INTERFERENCE SOIL/WASTE CHARACTERISTICS AVAILABILITY OF COVER MATERIAL GRAIN SIZE ATTERBERG LIMITS Z MOLSTURE PROC'OR COMPACTION PERMEABILITY TRIANIAL & DIRECTION PERMEABILITY TRIANIAL BURLITY TRIANIAL BURLITY TRIANIAL BURLITY TRIANIAL BURLITY TRIANIAL	VITRIFICATION	I	NERARED Z	CIRCULATING FLUIDIZED TATANG BED COMBUSTION		ANDFIL	AC			EFFLU	ENI DI	SCHAR	·	
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SITE CHARACTERISTICS STORAGE TIME ACCESSIBILITY LAND USE ECOLOGICAL AREAS VEGETATION TOPOGRAPHY ORAINAGE LOCATION/PERFORMANCE OF RCRA TREATMENT/DISPOSAL FACILITY LOCATION AND NEEDS OF FACILITY OR USER QUALITY, VOLUME CLIMATE PRECIPITATION WINC SPEED DIRECTION TRANSMISSIVITY, STORATVITY OFF HISTORY SUBSIFICATION TRANSMISSIVITY, STORATVITY OFF HISTORY O	<u>u</u>	ROTARY KILN INCINERATION	KAL WAL	COMB	PYROL YSIS	SITE	STRIA	TEMPORARY	REINJECTION	PUBLICALLY TREATMENT		SUBSURFACE DRAINS	ACE V	WATE
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- DEP'H TO MPERMEABLE STRATA - SEISMIC HISTORY - SUBSURFACE CHARACTERIZATION - TRANSHISSIVITY, STORATIVITY - DEPTH TO GROUNDWATER/LEACHATE - RATE & DIRECTION OF FLOW - HYDRAULIC CONDUCTIVITY - PUMPING RATE TO CONTAIN PLUME - LOCATIONS OF WELLS - WELL INTERFERENCE - SOIL/WASTE CHARACTERISTICS - AVAILABILITY OF COVER MATERIAL - GRAIN SIZE - ATTERBERG LIMITS - Z MOISTURE - PROCTOR COMPACTION - PERMEABILITY - TRIAXIAL & DIRECT - SHEAR TEST ISTRENOTH - Z ORGANIC MATTER - MICROBIOLOGY CELL ENUMERATIONS - DEPTH TYPE, THICKNESS OF BOTTOM - LINEA, AND FINAL LUYER - RECLARGE RATE - CONTAININGNIC CHARACTERISTICS - VOLATILITY - SORPIN, PARTITION COEFFICIENTS - EFFECTORNESS OF DUST SUPPRESSION - EFFECTORNESS OF DUST SUPPRESSION	-X													
- SUBSURFACE CHARACTERIZATION - TRANSHISSIVITY, STORATIVITY - DEPTH TO GROUNDWATER/LEACHATE - RATE A DIRECTION OF FLOW - HYDRAULIC CONDUCTIVITY - PUMPING RATE TO CONTAIN PLUME - LOCATIONS OF WELLS - WELL INTERFERENCE - SOIL/WASTE CHARACTERISTICS - AVAILABILITY OF COVER MATERIAL - GRAIN SIZE - ATTERBERG LIMITS - Z MOISTURE - PROCTOR COMPACTION - PERMEABILITY - TRIAXIAL & DIRECT - SHEAR TEST ISTREMOTH) - Z ORGANIC MATTER - MICROBIOLOGY CELL ENUMERATIONS - DEPTH. TYPE, THICKNESS OF BOTTOM - LINEAR, AND FINAL LUVEN - RECLARGE RATE - CONTAINING TO CARRACTERISTICS - VOLATILITY - SORRIC MATTER - VOLATILITY - SORRIC MATTER - CONTAINING TO CARRACTERISTICS - VOLATILITY - SORRIC MATTER - SORRIC MATTER - CONTAINING TO CARRACTERISTICS - VOLATILITY - SORRIC MATTER - SORRIC MATTER - CONTAINING TO CARRACTERISTICS - VOLATILITY - SORRICON PARTITION COEFFICIENTS - FEECT VENESS OF DUST SUPPRESSION												χ		
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SOLL/WASTE CHARACTERISTICS - AVAILABILITY OF COVER MATERIAL - GRAIN SIZE - ATTERBERG LIMITS - PROCEDURE LIMITS - PROCEDURE LIMITS - FROM THE LIMITS - TRIANIAL & DIRECT - SHEAR TEST (STRENOTH) - Z ORGANIC MATTER - MICROBIOLOGY CELL ENUMERATIONS - DEPTH. TYPE, THICKNESS OF BOTTOM LINEN, AND FINAL LUVEN - RECHARGE RATE - CONTEMINENT CHARACTERISTICS - VOLATILITY - SORPTION, PARTITION COSEFICIENTS - EFFECTIVENESS OF DUST SUPPRESSION						¥			x		X	X		
- AVAILABILITY OF COVER MATERIAL - GRAIN SIZE - ATTERBERG LIMITS - X MOISTURE - PROCTOR COMPACTION - PERMEABILITY - TRIANIAL & DIRECT - SHEAR TEST (STRENGTH) - X OPGANIC MATTER - MICROBIOLOCY CELL ENIMERATIONS - DEPTH, TYPE, THICKNESS OF BOTTOM - RECURROE RATE - CONTAMINANT CHARACTERISTICS - VOLATILITY - SORPTION, PARTITION COEFFICIENTS - EFFECTIVE SESS OF DUST SUPPRESSION - BEFECTIVE SESS OF DUST SUPPRESSION									Х		····X··	*		
- ATTERBERG LIMITS - X MOSTURE - PROC'OR COMPACTION - PERMEABILITY - TRIAXIA. & DIRECT - SHEAR TEST (STRENGTH) - X ORGANIC MATTER - MICROBIOLOGY CELL ENUMERATIONS - DEPTH. TYPE, THICKNESS OF BOTTOM - LINEN, AND FINAL LUYER - RECHARGE RATE - CONTAINING TO CHARACTERISTICS - VOLATILITY - SORPTION - PARTITION COEFFICIENTS - FRECTOVENESS OF DUST SUPPRESSION						¥								
- MICROBIOLOGY CELL ENUMERATIONS - DEPTH, TYPE, THICKNESS OF BOTTOM LINEH, AND FINAL LOVEH CONTAMINANT CHARACTERISTICS - VOLATILITY - SORPTION, PARTITION COEFFICIENTS - EFFECTIVENESS OF DUST SUPPRESSION	.X	··*·	¥	x	x	×					X	Ŷ		
- MICROBIOLOGY CELL ENUMERATIONS - DEPTH, TYPE, THICKNESS OF BOTTOM LINEH, AND FINAL LOVEH CONTAMINANT CHARACTERISTICS - VOLATILITY - SORPTION, PARTITION COEFFICIENTS - EFFECTIVENESS OF DUST SUPPRESSION						x					X	Ŷ		
CONTANIANT CHARACTERISTICS VOLATILITY - SORPTION PARTITION COEFFICIENTS	χ	x	¥	¥	X	X					···×	¥		
- VOLATILITY - SORPTION, PARTITION COEFFICIENTS - FFECTIVENESS OF DUST SUPPRESSION - PROCEDURALISM - PROCEDURA											x	x		
- EFFECTIVENESS OF DUST SUPPRESSION	· ¥	×	X	···X···	X									
- SOLUBILITY - DENSITY - COMPATABILITY - TOXICITY							¥.	¥	x	y		*	u	
WASTE CHARACTERIZATION	*	x	X	X	x	x		x	····x···	···¥··			¥	¥
- EXTENT OF CONTAMINATION	×	×	Š	. ž	X	X	×		X	····X	X X	X	x	
- GROUNDWATER								х	*	ж.	x	*	Х	
- SECOMENTS - SELDOSE - OTHER	*	··- X	x	×	X	X	x			х				
- AERIAL PHOTO INTERPRETATION														
- LÉACHATE/GAS COLLECTION/VENTING INFORMATION CHEMICAL/PHYSICAL ANALYSIS			••••											
	.X	. X	¥	¥	X	*	×.	¥	×	X	¥	X	¥	¥
- TDS	- X						×××××××××××××××××××××××××××××××××××××××		<u>X</u>	X	ģ	X		
- CÓÓ									X.		x	x	¥	
- TEMPERATURE - DISSOLVED GXYSEN							<u>x</u> .		ж.	х.	×	*	x	
- NO	-X						X		X	X X	X	X.	X	
- HEAT CONTENT		Š	×	X	Š									
- CHLORINE CONTENT		· *	***	···×	···×		x		X	х х	X	X		
SURFACE WATER CHARACTER STICS	·X	- X					x-		×-	х	X	×.		
- WATER DEFTH - GAUGE MEASUREMENTS - STREAM CHANNEL MORPHOLOGY														
SEDIMENT CHARACTERISTICS - BOTTOM SEDIMENTS CHARACTERISTIC	7	···×	x	X	y	····x						***		
- DREDGABLE VOLUME	-X	··¥··	¥	x	¥	¥	X	···¥··	x	····x	···×	x	x	X
- WATER QUALITY OF NEW SOURCE														×
- DISTANCE TO NEW SOURCE		•		<i></i>										A1
- INSTALLATION REQUIREMENTS - CURRENT AND PROJECTED WATER USE AND LOCATIONS							×	X	¥	X	X	ž	¥	Š.
STREAM CHANNEL MORPHOLOGY 100 YEAR FLOODPLAIN SEDIMENT CHARACTERISTICS BOTTON SEDIMENTS CHARACTERISTIC DREDGABLE VOLUME ARARS WATER SUPPLY INFORMATION WATER QUALITY OF NEW SOURCE LOCATION OF NEW SOURCE DISTANCE TO NEW SOURCE PROLITED TREATMENT			X X	X	X X				x	x	x -		х	X

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TABLE 4-1 PRELIMINARY IDENTIFICATION OF DATA NEEDS ACCORDING TO RESPONSE ACTION/REMEDIAL TECHNOLOGY HIMCO DUMP RI/FS ELKHART COUNTY, INDIANA CONSTRUCTION BELATED RELATED TABLE 4-1 PRELITION

	REL	UCTION ATED VITIES		ום	VERSI	N/COL	LECTIO)N	
DATA NEEDS SITE CHARACTER STICS	DUST CONTROL	EXCAVATION/ REMOVAL	NO ACTION	INSTITUTIONAL	DIKES AND BERMS	GROUNDWATER EXTRACTION WELLS	GRADING	SILT FENCES	REVECETATION
- STORAGE TIME		x			¥			Υ	
~ [AND USE	x	x	×	×			Mr	Š	×
- ECOLOGICAL AREAS	Ţ	X	ŷ]ĝ	ŷ		X	ĝ	
TOPOGRAPHY		x	X	· · · x · · ·	X		X	··· X ··· X	x
- LOCATION/PERFORMANCE OF RCRA TREATMENT/DISPOSAL FACILITY			ļ						
- LOCAT ON AND NEEDS OF FACILITY OR USER QUALITY, VOLUME		¥	x	x	y ,	x			×
CLIMATE									<u> </u>
PRECIPITATION TEMPERATURE EVAPORATION MINO SPEED DIRECTION HYDOGEOLOGY	····X··	· · · · ¥ · ·			X	···X···	x	· · · · X · -	¥
- EVAPORATION	}								\$
- WIND SPEED D RESTION	X			1					
SE SUIC HISTORY SE SUIC HISTORY SE SUIC HISTORY SESURGE CHARACTERIZATION IRANSWISSIVITY STORATULTY DEPTH TO CROUNDWATER/LEACHATE RATE & DIRECTION OF FLOW HYDRAULTIC CONDUCTIVITY PUMPING RATE TO CONTAIN PLUME LOCATIONS OF WELLS WELL INTERFERENCE			×	х		X			
- SUBSURFACE CHARACTERIZATION		X	x	x		ж			
- TRANSMISSIVITY, STORATIVETY	t		X	···X		¥			Υ
- RATE & DIRECTION OF FLOW			x	X		X			
- PUMPING RATE TO CONTAIN PLUME			Į ∴	{					
- WELL INTERFERENCE						g			
SOIL/WASTE CHARACTERISTICS	<u> </u>		L						
- AVAILABILITY OF COVER MATERIAL									· * ···
	×	X			X	×	X	X	X
- % MOISTURE	x	X	1		v			×	· X · · ·
- PERMEABILITY		···	·····		·····ĝ···			ŷ	···X · · ·
SHEAP TEST (STRENGTH)	ļ. 								
- % ORGANIC MATTER	X	X	*	X			X		X
- DEPTH, TYPE, THICKNESS OF BOTTOM		ļ							
- PROCIOR COMPACTION - PRIMERBILITY - TR AN AL & D RECT - STEAM EST (STRENGTH) - CORGANIC MY TER ENUMERATIONS - CORGANIC MY TERMER ENTER - CORGANIC MY TERMER ENTER - CORGANICATION CONTROL OF BOTH ON THE CORPOR BATE - CONTROL OF BATE - CONTROL			·····	···		···×			
CONTAMINANT CHARACTERISTICS				 -					
- SORPT ON PARTITION COEFFICIENTS			×	X					
- EFFECT VENESS OF DUST SUPPRESSION	×								
- SOLUB LITY			X	×	• • • • • •	x			
COMPATABILITY			·	(i					
WASTE CHARACTER ZATION	1	X	···X··	x					
- VO_UME	x	x	х	X		· · · ¥ · · ·			
- VOLUME - EXTENT OF CONTAM NATION	×	×	X	X		X			X
_ A	ŏ		X	· · · X · · ·					.
- GROUNDWATER			Σ	ğ.		x			
- SEDIMEN'S			x	· · · X · ·	х			X	
SOLS GROUNDWATER LOUID WASTE SEDIMENTS SLOGE			х	x	X			x	
				···×					
LINER WT OF WASTE			· · · · · ·						
DRIVS UT OF WASTE LEAD-HATE/SAS COLLECTION/VENTING INFORMATION	}	ļ		} 					
CHEMICAL/PHYSICAL ANALYSIS	<u> </u>		<u> </u>	[]					
- ORGANIC COMPOUNDS									×
- ME*ALS	ļ	x	ļ	[• • • • • • • • • • • • • • • • • • •		.
TSS									χ
. 105			1			· · · · · · · · · · · · · · · · · · ·			
- COD									×
TEMPERATURE DISSCLYED OXYGEN						1			
NUTRENTS									ğ
. N	·····		ļ						
CIL AND GREASE HEAT CONTENT ASH CONTENT	J		Į						
ASH CONTENT					1				
CHEORINE CONTENT			}	·····					
Fe Mn MARDNESS ALKAL NITY SULFATES									
SULFATES									
WATER GERTH									
		x	X	×					
100 YEAR FLOODPLAIN			≨	X	X			x	
SECTIMENT CHARACTERISTICS		¥.							
VALUE MEASURINE VORPHOLOGY 100 YEAR FLOODPLAIN 1801-VENT CHARACTERISTICS BOTTOM SECTION S CHARACTERISTIC DREDGABLE VOLUME	····X	ĝ	X	×					
- ARARS		····X···	х	···× ··	x	··· X ···	×	···X··-	-
WATER SUPPLY INFORMATION - WATER QUALITY OF NEW SOURCE									
MATERITARY TO NEW SOUPER SOUPE							:		
- REGURED THEATMENT								{	
NS ALLAT ON REGUREMENTS									
- CYRRENT, AND PROJECTED MATER USE	[<u>]</u>		l !	1].	

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TABLE 4-1 PRELIMINARY IDENTIFICATION OF DATA NEEDS ACCORDING TO RESPONSE ACTION/REMEDIAL TECHNOLOGY HIMCO DUMP RI/FS ELKHART COUNTY, INDIANA CONTAINMENT COLLECTION/ BIOLOGICAL TREATMENT

		CONT	AINMEN	1	COLLE	AS CTION/ EVERY	BIC	BIOLOGICAL TREATMENT					
DATA NEEDS SITE CHARACTER STICS	DUST CONTROL	CAPPING/ SURFACE SEALING	SLURRY WALLS	GROUNDWATER PUMPING	PASSIVE SUBSURFACE GAS CONTROL	ACTIVE SUBSURFACE GAS CONTROL	AEROBIC	ANAEROBIC	LAND	IN-SITU BIOLOGICAL	PACT SYSTEM		
STORAGE TIME ACCESSIBILITY LAND USE ECOLOGICAL AREAS VIGET ION TOPCORAPHY		y	×	x	X	· · · X				¥			
- LAND USE	···¥···	×				···×			XXXX	×			
- VEGETATION	l		. X	x					ŷ	···×··	l		
- TOPCGRIPHY - DRAINAGE - LOCATION/PERFORMANCE OF RORA - TREATMENT/DISPOSAL FACILITY - LOCATION AND NEEDS OF FACILITY - OR USER QUALITY, VOLUME		ļ	·¥		ŷ				ŷ	×			
TREATMENT/DISPOSAL FAC LITY													
OR USER CUALITY, VOLUME	x			x	X	· · · X				···¥··			
CL-MATE - PRECIPITATION	X		 	X				V					
- TEMPERATURE		×			×	×	X	×.	X	···×	. X		
- WIND SPEED DIRECTION	х												
- DEPTH TO MPERMEABLE STRATA			¥	x	X	· X	,						
- SE SMIC HISTORY			×		X	¥			y	¥			
- TRANSMISS VITY, STORATIVITY		Y		X	x	Š			X X	×			
RATE & DIRECTION OF FLOW		1	ğ	X X X		····×			····ÿ	§			
PUMPING RATE TO CONTAIN PLUME		ļ		ĝ							···-		
TOTAL STATE OF MACROSABLE STATE SE SWIC HIS TOR SE SE SWIC HIS T				···· ĝ		×							
201E1 11 A C C 14 (ACT 2 1 3 2 3	<u> </u>		<u> </u>	 	ļ	 							
AVAILABILITY OF COVER MATERIAL GRAIN SIZE ATTERBETS LIMITS X MOSTURE PROCTOR COMPACTION PERMEABILITY	X	XXXXXX	×	×	X	···¥			х				
ATTERBERG L'MITS	×	Ÿ	×	×	š	X			X				
PROCTOR COMPACTION	·-*·-		× ×		§				.	x	l		
TRIAXIAL & DIRECT		l .			l^	Ĺ^			^				
A CREANIC MATTER	×	×								×			
DEPTH TYPE, THICKNESS THE BOTTOM									1		1		
PERMEABLITY TRIANIA à DIRECT SHEAR TEST (STRENGTH) TORGANIC MATTER MICROBIOLOGY CELL ENDUERATIONS DEPTH TYPE, THICKNESS OF BOTTOM LINES, AND FINAL COVER RECHARGE RATE ONTAMINANT CHARACTERISTICS				ļ									
CNTAMINANT CHARACTERISTICS				<u> </u>	-			-		├ ─	-		
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TABLE 4-1 PRELIMINARY IDENTIFICATION OF DATA NEEDS ACCORDING TO RESPONSE ACTION/REMEDIAL TECHNOLOGY HIMCO DUMP RI/FS ELKHART COUNTY, INDIANA PHYSICAL/CHEMICAL TREATMENT

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USG: L102231 INEEDS, DGN NEEDS 3

Date: July 1990

Data needs specific to the Himco Dump RI/FS have been identified by evaluating existing data with reference to the Conceptual Site Model (Figure 3-1) and

Section No.: 4.0

Revision No.: 0

existing data with reference to the Conceptual Site Model (Figure 3-1) and determining what additional data are necessary in order to accomplish the project objectives. The RI field program will key in on the sampling and analysis of the suspected primary source and the pathways as presented in the Conceptual Site Model.

Data needs were also identified according to response action/remedial technologies identified as potentially feasible for this site. Table 4-1 presents a matrix which relates the potential general response action and remedial technology for the Himco Dump with the data needed to evaluate the response action. Table 4-1 represents only a preliminary identification of data needs according to general response actions and remedial technologies and is used as a guide to determine data requirements.

As shown in Figure 3-1, the primary suspected contaminant source at the Himco Dump site is the landfill. No direct analysis of the composition and concentrations of the fill or leachate is available. The specific types, depth, and amount of waste disposed of at the site is unknown. Therefore, no straightforward statistical method is available for determining the expected variations or sampling density required to obtain a representative estimate of the contamination. Instead, a sampling grid will be established on the fill on arbitrarily chosen 250-foot centers to provide a systematic coverage of the fill area. The limits of fill will be determined by an electromagnetic survey. Fill samples will be collected for chemical analysis (DQO Level IV) at the surface (0 to 6 inches) to determine if risk to receptors by particulate emission releases exists and to evaluate remedial alternatives. Geotechnical analysis will be done on samples collected to depth of three feet in the waste. DQO Level III for the geotechnical parameters of consolidation and triaxial shear. These geotechnical parameters are needed to predict the amount and rate of settlement of the fill under loads and to determine the strength of the existing cap for remedial alternative selection.

Field instruments will be used to measure the percent methane and hydrogen sulfide in the borings using DQO Level I. A field portable photoionization detector will be used to provide data on the order of magnitude of volatile organic compounds at each of the borings (DQO Level I). Soil vapor (ground) probes as described in the Air/Superfund National Technical Guidance Study Series, EPA-450/1-89-002 Volume II will be utilized. Selected borings with the highest field volatile organic compound concentrations will be sampled using a calibrated pump and sorbent tube. Samples will be analyzed using DQO Level V to determine the identity and quantity of volatile organic compounds in the waste mass gas for purposes of risk assessment and remedial alternative selection. If leachate seeps are visible during the Phase I field program, they will be sampled and analyzed using DQO Levels IV and V.

The secondary contaminant source area at the Himco Dump Site is the soil. Based on the measured contamination in groundwater immediately downgradient of the site, the vadose zone soil is believed to be contaminated. However, no direct analysis of any site soils has been done. Deeper subsurface drilling

Section No.: 4.0 Revision No.: 0 EPA Contract No. 68-W8-0093 Date: July 1990

through the waste to sample underlying soil is not proposed for Phase I RI activities. However, during installation of the 10 proposed new monitoring wells, soil samples will be collected and analyzed using DQO Level IV. Selected soil samples will also be analyzed for the geotechnical parameters of Atterberg limits, grain size, and permeability using DQO Level III to characterize the material properties.

Four potential contaminant immigration pathways have been identified in the Conceptual Site Model. Groundwater is the pathway of greatest concern, as site-derived contaminants have been measured historically and receptors are located immediately downgradient of the site. Groundwater from both existing USGS wells and the proposed new wells will be collected and analyzed quarterly for one year using DQO Levels IV and V. Analytes will include the Target Analyte List (TAL) metals and cyanide, and the Target Compound List (TCL), volatile, acid/base neutral and PCB/pesticide semivolatile organics.

In addition to the CLP TCL organic and TAL inorganic analytes, several water quality parameters will be measured (DQO Level V) in the groundwater collected to assess specific impacts from the fill and evaluate remedial alternatives. The rationale for the parameters selected is as follows:

Biochemical Oxygen Demand (BOD): Assess the degree of microbially mediated oxygen consumption by contaminants; high levels may affect remedial alternatives selection.

Chemical Oxygen Demand (COD): Measure of chemical oxidation in water; poorly degradable contaminants will elevate COD above BOD level and may affect remedial alternative.

Chloride: Major mobile anion associated with typical landfill leachate.

Sulfate: Anion associated with typical landfill leachate; reduction of sulfate and organic sulfur to H2S occurs in anaerobic conditions, and oxidation of H2S to sulfate occurs in aerobic conditions.

Ammonia, Nitrate and Nitrite, Total Kjeldahl Nitrogen: Nitrogen species are pH dependent; specification of the nitrogen species present is needed for remedial alternative selection.

Total Phosphorus: Indicator of agricultural use (on-site cropland); high levels enhance algae growth and may complicate some treatment alternatives.

Total Dissolved Solids, Total Suspended Solids: Remedial alternatives such as filtration and sorbtion are dependent as solids loading.

Alkalinity: Measure of buffering effect and ability to support algae growth; high levels may complicate some treatment alternatives.

Bromide: Mobile anion previously detected by USGS and selected as the

Section No.: 4.0

Revision No.: 0

Date: July 1990

Bromide: Mobile anion previously detected by USGS and selected as the indicator of the plume from the site.

The chemistry data will be used to determine the nature and extent of contamination and to develop the risk assessment. In order to fully evaluate remedial alternatives, hydrogeologic data also need to be collected. Aquifer conductivity will be determined using slug tests on new and existing wells. Water levels will be measured to develop a groundwater table map. Groundwater discharge to surface water bodies (quarry, fish ponds) will also be assessed with staff gauges. Field parameters that assess groundwater stability after purging (pH, conductivity, dissolved oxygen (DO) and temperature) will be measured in the field using DQO Level I.

Private well sampling will be conducted at the six residences that are located along the southern edge of the site. Historical data indicated elevated levels of the water quality parameters of COD, iron, and manganese in the shallow wells on these properties. No validated chemistry data are available on the deeper wells which were drilled after the shallow wells were found to be contaminated. DQO Level V will be used in the analysis of the private well samples, as the CLP Routine Analytical Services (RAS) detection limits are not low enough to meet MCLs and RMCLs for drinking water. Field parameters of pH, conductivity, dissolved oxygen (DO), and temperature will be measured in the field using DQO Level I to assess groundwater stability after purging.

The surface water and sediment pathway will be sampled during the Phase I RI using DQO Levels IV and V. Two fish ponds and a quarry are located adjacent to the fill area and may be impacted from the site. No historical chemical data exist for the surface water or sediment. Data will be used in the development of the ecological and human risk assessment.

During Phase I of the RI, a determination of the presence or absence of wetlands as defined by the Federal Manual for Identifying and Delineating Jurisdictional Wetlands will be made using DQO Level I. Surface soils on-site will be sampled; if wetlands are determined to be present and an interconnection with impacted groundwater/surface water from the landfill exists, sampling of wetland soils offsite will also be conducted.

The air pathway will be modelled using data on volatile organic concentrations collected from the DQO Level V waste mass gas monitoring during Phase I. No direct air monitoring and sampling is planned for Phase II unless data from Phase I indicates a significant risk to receptors.

4.2 REMEDIAL INVESTIGATION APPROACH

4.2.1 Introduction

The RI will be implemented by conducting a two-phased field investigation. Data will be collected in both phases to simultaneously accomplish the RI objectives and to provide design and cost estimate information related to FS

justified.

objectives. As the RI and FS are conducted together, and the RI data influences the FS remedial alternatives development process which affects the data needs for treatability studies, more than one phase of field investigations is

Section No.: 4.0

Revision No.: 0

Date: July 1990

Phase I will determine if a source exists and if a release via the groundwater pathway has occurred. If a source and release is indicated by the Phase I RI data, Phase II will further define the release and fill any data gaps for the ecological and human risk assessments, treatability studies, and remedial alternative evaluations.

Decisions to be made based on data collected during the RI/FS are:

- What constitutes the extent of landfilling in the study area?
- Is a source of contamination present?
- Has a contaminant release occurred?
- What is the nature and extent of contamination?
- Does the site present a human health risk?
- Does the site present an environmental risk?
- What remedial alternatives are appropriate?

Users of the data generated from this RI/FS will consist of the EPA, Indiana Department of Environmental Management (IDEM), health assessment scientists, engineers, hydrogeologists, geologists, biologists, and chemists. The potentially responsible parties (PRPs) will also review the data collected. If wetlands are determined to be present, a 404 permit may be required. The U.S. Fish and Wildlife Service will also be involved in the endangerment assessment.

The Phase I field investigation will consist of the following tasks:

- Site survey and topographic mapping.
- Electromagnetic survey for fill boundary determination.
- Magnetic survey to determine presence of buried drums.
- Excavation of test pits (if necessary)
- Determination of the presence/absence of wetlands.
- Wetland soil sampling and analysis.
- Monitoring well installation, sampling, and analysis (samples collected quarterly for one year).
- Soil boring sampling and analysis.
- Existing monitoring well sampling and analysis (samples collected quarterly for one year).
- Private well sampling and analysis (samples collected quarterly for one year).
- Leachate sampling and analysis (if seeps are present).
- Landfill waste sampling and geotechnical analysis.
- Landfill cap surface soil sampling and analysis.
- Landfill waste mass gas sampling and analysis.
- Residential gas sampling.
- Sediment and surface water sampling analysis from quarry.

Revision No.: 0 Date: July 1990

Section No.: 4.0

- Sediment and surface water sampling and analysis from fish ponds.
- Installation of staff gauges.
- Cone penetrometer test

The scope of any Phase II field investigation will be dependent on whether a source exists and releases to groundwater, surface water, sediment, and air have occurred. The following tasks may be accomplished in Phase II if a source exists and a release is indicated by the Phase I RI data:

- Gravity survey to map bedrock valley location.
- Sampling and analysis of quarry biota.
- Sampling and analysis of pond biota.
- Air pathway analysis.

The rationale for each of the tasks and a summary of the field procedures to be used are discussed below. Detailed descriptions of exact sample locations and specific sample collection protocols are included in Volume 2 of the Field Sampling Plan.

4.2.2 Phase I RI

A survey of the site to locate legal boundaries for PRP determinations and access and to establish horizontal and vertical controls relative to the National Geodetic Vertical Datum (1929) will be conducted. A topographic map will be drawn from data collected during an aerial survey, and a geophysical (electromagnetic) survey will be conducted to delineate the limits of fill. Field reconnaissance to determine if wetland areas exist will include a visual survey of vegetation and soil cores. A base map legal description and grid plan will then be prepared indicating the locations of wetlands, fill, drainage patterns, surface water bodies, buildings, utilities, paved areas, and other pertinent features.

Wells installed in the Elkhart County area by the USGS were constructed with solvent glue joints. No grout or seals were used. Specific contaminants have been shown to be related to solvent glues: methyl ethyl ketone, toluene, acetone, methylene chloride, benzene, ethyl acetate, tetrahydrofuran, cyclohexanone, vinyl chloride, and organic tin compounds. Data from the 1984 study conducted by the FIT team indicated the presence of acetone, benzene, and toluene in the USGS wells and field blank. Tin was also detected in the deep USGS wells. Methylene chloride, a common lab contaminant, was also detected, but at low levels that may have been due to lab contamination alone.

In addition to sampling existing USGS wells, ten new groundwater monitoring wells will be installed to alleviate questions on well construction and groundwater chemistry data integrity. The new wells will be installed using state of practice construction (Teflon-threaded PVC). One new well nest will be installed in the vicinity of Wells M and E to determine if the hydraulic conductivity and the groundwater chemistry is affected by the differing well construction.

the site geology.

Soil from the monitoring well installation borings will be collected and analyzed for metals, volatile organics, acid/base-neutral organics, and PCBs pesticides. Additional soil samples from the borings will be collected and analyzed for Atterberg limits, grain size, and permeability to characterize

Section No.: 4.0

Revision No.: 0

Date: July 1990

Groundwater collected from the network of existing USGS wells and new wells will be analyzed for metals, volatile organics, acid/base-neutral organics, PCBs/pesticides, and water quality parameters. Hydraulic conductivity as determined by a slug test will be measured in selected wells to further characterize site hydrogeological conditions. Water level data will be collected and used to develop a groundwater contour map.

Deep private wells located along the southern edge of the site will be sampled and analyzed for metals, volatile organics, acid/base-neutral organics, PCB/pesticides and water quality parameters. If the abandoned shallow private wells are accessible, they will also be sampled and analyzed to determine if the contaminants are similar to those in the new and existing downgradient wells.

In order to attempt to chemically characterize the source, leachate will be sampled by digging a sump at seep locations. Leachate will be analyzed for metals, volatile organics, acid/base-neutral organics, PCBs/pesticides, and water quality parameters to determine if groundwater contamination is related to leachate levels.

As part of the site survey, a grid consisting of 100-foot centers across the surface of the fill will be established. Landfill waste sampling for consolidation and triaxial shear at five locations will occur using three-foot shelby tubes. The geotechnical data will be used to predict the amount and rate of settlement of the existing fill under loads and to determine the strength of the existing cap. Surficial landfill cap samples (6-18 inches) will be collected on a systematic grid with 250-foot centers at twelve locations. This approach was selected according to the principles described in "Methods for Evaluating the Attainment of Cleanup Standards, Volume 1: Soils and Solid Media," (EPA/1230/02-89-042) and "Determining Soil Response Action Levels Based on Potential Contaminant Migration to Groundwater: A Compendium of Examples," (EPA/540/02-89-057). Samples will be analyzed for metals, volatile organics, acid/base-neutral organics, and PCBs/pesticides. The data will be used to evaluate if particulate emissions and wind-blown dust from the site present a risk.

During landfill cap sample collection, stainless steel gas collection probes will be driven at least 3 feet into the cap at 12 on-site locations selected where field organic vapor and/or methane/hydrogen sulfide are detected. The number of samples necessary to statistically assess the waste mass gas was determined using the Soil Sampling Quality Assurance Users Guide, EPA/600/8-89-046. Waste mass gas samples will be collected from the probes using a calibrated sampling pump and sorbent tube. Collection will be in accordance with the https://discrete.com/Air/Superfund National Technical Guidance Series,

Himco Dump RI/FS Final Work Plan

Revision No.: 0 EPA Contract No. 68-W8-0093 Date: July 1990 EPA-450/1-89-002, Volume II. The sorbent tubes will then be analyzed for

Section No.: 4.0

volatile organics. Data from the gas probes will be used to determine if volatile emissions are a significant release mechanism to be considered in the risk assessment. The quality and estimated quantity of gas will also be used during remedial alternative selection.

The quarry and fish ponds located adjacent to the suspected fill area will be investigated to determine if a risk to both environmental and human receptors exists. Staff gauges will be installed to develop the groundwater contour map and determine groundwater/surface water interaction. Surface water grab samples will be collected and analyzed for metals, volatile organics, acid/ base-neutral organics, PCBs/pesticides, and water quality parameters. Sediment grab samples will be collected and analyzed for the same parameters as surface water with the exception of the water quality parameters.

All data collected during the Phase I RI will undergo quality control review as described in the Quality Assurance Project Plan (Volume 3). Decisions on the final scope of the Phase II investigation will be made after a review of the Phase I data. Remaining data needs for ecological and human risk assessments and remedial alternative evaluation will be addressed in Phase II.

4.2.3 Phase II RI

An addendum to the Work Plan may be prepared and submitted to EPA for approval. The actual scope of any Phase II RI will be dependent on the data and data gaps identified after Phase I. Based on the worst case assumptions that a contaminant source and jurisdictional wetlands exist and releases have occurred to groundwater, surface water, sediment, and air, the field investigation may consist of sampling pond and quarry biota and conducting an air pathway analysis. Additionally, if deep USGS and newly installed wells are impacted, a gravity survey to delineate the location and orientation of the bedrock valley may be conducted. Treatability studies may also be needed after the development and screening of alternatives during the FS.

4.3 FEASIBILITY STUDY APPROACH

General response actions and preliminary applicable remedial technologies have been identified for this site based on available historical information. Data needs related to alternative evaluation have been identified as discussed previously.

The size and uncertainties pertaining to the site have resulted in the development of a phased and integrated approach to the RI/FS. The scope of the RI is designed to answer data needs in three main areas: the risk assessment, the alternatives evaluation, and enforcement activities. By designing the RI to address these areas, we are attempting to focus and streamline the RI/FS so that adequate data are collected and the number of technologies and alternatives to be considered in the FS can be minimized. When the RI data are available, the level of uncertainity in the Conceptual Site Model will be

Section No.: 4.0
Revision No.: 0
Date: July 1990

evaluated. Potential additional data needs may be identified, and uncertainties will be evaluated during the FS development, screening phase, and detailed analysis. These items will be incorporated in the FS and their effects on the alternative evaluation documented.

5.0 REMEDIAL INVESTIGATION/FRASIBILITY STUDY TASKS

Section No.: 5.0

Revision No.: 0

Date: July 1990

The Himco Dump RI/FS will be implemented using a two-phased approach involving performance of the standard tasks identified in the EPA Statement of Work. These tasks are described in the following sections.

5.1 TASK 1 - PROJECT PLANNING

The project planning task includes activities from project initiation through completion of the project plans. The following project activities have been completed:

- A project kickoff meeting involving the EPA Remedial Project Manager, Donohue Site Manager, and Donohue Community Relations Manager.
- A project scoping meeting involving technical specialists.
- A site visit.
- A Data Quality Objectives scoping meeting.
- A pre-QAPP meeting.
- Collection and evaluation of existing information. (It is anticipated that collection and evaluation of existing data will continue throughout the RI.)
- Identification of preliminary remedial action alternatives.
- Preliminary determination of ARARs.
- Preparation of RI/FS draft project plans including the Work Plan, Quality Assurance Project Plan, Field Sampling Plan, and Health and Safety Plan.

5.2 TASK 2 - SITE INVESTIGATION

5.2.1 Investigative Support

Before beginning field activities, Donohue through our pool subcontractor will prepare a topographic map with a scale of 1":100' and two-foot contour intervals. The base map will illustrate the locations of wetlands, floodplains, water features, drainage patterns, tanks, buildings, utilities, paved areas, easements, rights-of-way, and other pertinent features. A legal description of the property will be obtained, reviewed, and field checked. The intent of the field check is to ensure that future activities do not carry over onto adjacent properties without proper permission.

Himco Dump RI/FS Final Work Plan

Section No.: 5.0 Revision No.: 0 EPA Contract No. 68-W8-0093 Date: July 1990

Donohue will also assist EPA in obtaining an access agreement to enter the site. Donohue may assist EPA in the future in negotiating access agreements.

Donohue will make arrangements to construct the appropriate support facilities and/or procure the equipment and services necessary to perform a hazardous site investigation. This includes preparation of bid documents, decontamination facilities, utility hookups, and site access control stations.

5.2.2 Field Investigation

The field investigation will include the following activities: subcontracting, mobilization and demobilization, cap/soil sampling, wetland soil sampling, waste mass gas analysis, monitoring well installation, borehole drilling, electromagnetic/magnetic survey, excavation of test pits, slug testing, groundwater sampling, surface water and sediment sampling, staff gauge installation and monitoring, surveying, and quality control review of all activities. These activities are listed in Section 4.2 and described in detail in the Field Sampling Plan (Volume 2).

There will be a total of three pool subcontract types; drilling, surveying, and facilities.

The drilling pool subcontract will include: drilling, sampling, monitoring well installation; excavation of test pits, collection and drumming of all drilling cuttings in 55-gallon drums; collection of drilling fluids, development and purge water collected in a 10,000-gallon frac tank; building a fenced-in decontamination (steam cleaning) and drum storage area; and developing monitoring wells with a submersible pump.

The surveying pool subcontract will include: a fly-over of the site in order to produce a topographic map; a field survey to establish vertical and horizontal controls; an owners of record search for the site; and a field survey of monitoring wells and staff gauges upon completion of Donohue's field work.

The facilities pool subcontracts will include: a field trailer for the site command post; furniture; washroom facilities; telephone and electrical service; a fax and photocopier; a refrigerator; and field vehicles.

5.3 TASK 3 - SAMPLE ANALYSIS AND DATA VALIDATION

This task includes analysis of samples collected during the field investigation and validation of data. As indicated in the QAPP and FSP, samples collected during the field investigation will be analyzed through Contract Laboratory Program (CLP) laboratories, and data validation will be performed by the EPA Region V Environmental Service Division. Information from this task will be included in RI report appendices.

Section No.: 5.0 Revision No.: 0 Date: July 1990

5.4 TASK 4 - DATA EVALUATION

This task will include analysis of chemical and physical data after the data are verified to be of acceptable accuracy and precision. Data evaluation will be initiated upon receipt of validated field data from the field investigation (Task 2) and after sample analysis and data validation of laboratory parameters are performed (Task 3). Data evaluation activities may include data reduction and tabulation, calculation of aquifer characteristics, statistical analysis, environmental fate and transport modeling, and mapping. The results of this task will be summarized in technical memoranda which will be used in subsequent tasks and which will be incorporated into the RI report.

5.5 TASK 5 - RISK ASSESSMENT

This task consists of assessing risks to human health and the environment and includes those activities listed in the Endangerment Assessment Plan, included as Appendix A to this Work Plan. A detailed baseline public health evaluation and a qualitative assessment of potential ecological risks will be performed in Phase I. The Ecological Assessment Plan is included as Appendix B to this Work Plan.

5.6 TASK 6 - TREATABILITY STUDIES

The necessity and specific requirements for bench-scale and/or pilot treatability studies will be assessed after data from the field investigation are evaluated, and alternatives are developed and screened.

5.7 TASK 7 - RI REPORT

A draft RI report will be prepared which summarizes the activities performed, data collected, and conclusions drawn from on-site and off-site investigations. The report will include an updated site description, results of field investigation and laboratory analyses, a discussion of potential routes of contaminant migration, and a baseline risk assessment. Comments received from EPA and IDEM will be addressed in completing the final RI report.

Monthly reports will be submitted to the EPA describing the technical progress and the financial and schedule status of the Himco Dump RI/FS.

5.8 TASK 8 - REMEDIAL ALTERNATIVES DEVELOPMENT AND SCREENING

The Superfund Amendment and Reauthorization Act (SARA) of 1986, Section 121, specifies consideration of remedial alternatives that reduce the toxicity, mobility, or volume of waste. SARA states a preference for treatment technologies that meet the reduction requirement and provide permanent solutions.

Section No.: 5.0 Revision No.: 0 Date: July 1990

General response actions and appropriate remedial technologies have been identified for the Himco Dump site based on current knowledge of the site from historical information. These general response actions will be reviewed and may be expanded or reduced.

5.8.1 <u>Development of Remedial Action Objectives</u>

Identification of remedial technologies depends on establishment of remedial action objectives (RAOs). The RAOs are based on:

- The description of the current situation including review of existing data.
- Information gathered during Phase I RI.
- Public health and environmental concerns in terms of exposure routes and receptors.
- Identification of an acceptable level or range of levels for each exposure route.
- The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) guidance governing remedial action, 40 CFR 300, Section 300.68.
- Interim and draft guidances from EPA.
- Any other applicable cleanup standards defined in SARA, Section 121.

The preliminary RAOs, expressed in terms of medium of interest and target cleanup levels, are discussed in Section 3.3 of this Work Plan. Preliminary cleanup objectives will be confirmed in formal consultation with the EPA and IDEM once the endangerment assessment is completed.

5.8.2 Development of General Response Actions

Following the establishment of the RAOs, general response actions that may be taken to achieve exposure limits specified by the RAOs will be determined. General response actions are medium-specific and may include containment, treatment, or removal actions. Preliminary general response actions are discussed in Section 3.3.

5.8.3 Identification of Volumes or Areas of Media

During the development of alternatives, an initial determination of areas or volumes of contaminated soils, groundwater, and sediments, and landfill gas will be made to which general response actions might be applied. Response actions or volumes may be refined after further information becomes available. The volumes or areas addressed by the alternatives will be reviewed with respect to the remedial action objectives to ensure that alternatives can be assembled to reduce exposure to protective levels.

5.8.4 <u>Identification and Screening of Remedial Technologies and Process</u> Options

Alternatives developed from the RAOs include the following:

Source control treatment alternatives that would eliminate the need for long-term management (including monitoring).

Section No.: 5.0

Revision No.: 0

Date: July 1990

- Treatment that reduces the toxicity, mobility, or volume of the hazardous waste.
- Containment of waste with little or no treatment.
- No-action alternative.

Potential media-specific treatment and disposal technologies and process options identified for the general response actions are screened solely on the basis of technical implementability. During this screening step, process options and entire technology types may be eliminated from further consideration.

5.8.5 Evaluation of Process Options

The evaluation of process options will incorporate considerations from three broad criteria: effectiveness, implementability, and cost. The review will place greater emphasis on effectiveness with less effort at implementability and cost to preserve a range of alternatives for further analysis. Whenever appropriate, innovative technologies will be carried through this phase of the screening. The rationale for eliminating a process option will be documented in the FS report.

Effectiveness

The considerations important in the evaluation of process options are as follows:

- Potential effectiveness in attaining identified contaminant goals and in handling the estimated areas or volumes.
- Adequate protection of human health and the environment.
- How proven and reliable the process is with respect to the contaminants and conditions at the site.

Implementability

Each process option will be evaluated for:

- Availability of the technologies employed by the solution.
- Availability of storage and disposal services.

Himco Dump RI/FS Final Work Plan

Section No.: 5.0 Revision No.: 0 EPA Contract No. 68-W8-0093 Date: July 1990

- Availability of necessary skilled workers to implement the technology.
- The administrative feasibility of implementing the alternative.

Cost Evaluation

Cost evaluation will play a very limited role in this evaluation process, since it is based on relative capital and operation and maintenance (O&M) costs and not detailed estimates.

The costs of construction and any long-term O&M costs will be based on present-worth analysis. Financial considerations during this evaluation will only be used to screen between process options relative to other process options in the same technology type. Cost factors will not be used to distinguish between treatment and non-treatment options.

5.8.6 Assembly of Alternatives

Following the evaluation of process options, general response actions remedial technologies and the process options chosen to represent the various technology types for each media type will be combined for the site as a whole. Assembly of alternatives may include remediation of different volumes and/or areas of the Himco Dump site and one or more general response actions for each medium. General response actions are combined to form a range of site-wide alternatives. A description of each alternative will be included in the FS report. These descriptions may include the following information:

- Locations of areas to be excavated or contained.
- Approximate volumes of soil, groundwater, surface water, and/or sediment, and landfill gas to be excavated and/or collected.
- Approximate location of potential water hookups, and connections to local publicly owned treatment works (POTW).
- Management options for treatment residuals.

5.8.7 Alternatives Definition

The following considerations will be defined and developed as they apply to each alternative:

- Extent or volume of contaminated soil, groundwater, surface water, and
- Size and configuration of on-site extraction and treatment systems or containment structures.
- Time frame in which treatment, containment, or removal goals can be achieved.

Rates or flows of treatment.

Spatial requirements for constructing treatment or containment technologies or for staging construction materials or excavated soil or sediment.

Section No.: 5.0

Revision No.: 0

Date: July 1990

- Distances for disposal technologies.
- Required permits for off-site actions and imposed limitations including action-, location-, and chemical-specific ARARs.

5.8.8 Screening Evaluation of Alternatives

The number of alternatives that will undergo a more thorough and extensive analysis during the detailed analysis phase may need to be reduced. The screening evaluation of alternatives provides a final opportunity prior to the detailed analysis to make this determination. If needed, the alternatives will be evaluated on a general basis to determine their effectiveness, implementability, and cost. Evaluation performed at this time will be sufficiently detailed to distinguish among alternatives.

Effectiveness

The following considerations will be evaluated for each alternative:

- Protectiveness.
- Reduction in toxicity, mobility, or volume.
- Short-term and long-term components of protectiveness.

Implementability

The evaluation will consist of the following components:

- Technical feasibility.
- Administrative feasibility.

Cost

The following cost estimates will be considered:

- Comparative cost estimates for alternatives with relative accuracy.
- Capital and O&M costs including costs that will be incurred over the duration of the remedial action.
- Present-worth analysis.

Section No.: 5.0 Revision No.: 0 Date: July 1990

Innovative Technologies

Innovative technologies will be carried through the screening phase if the alternative offers a potential for:

- Better treatment performance or implementability.
- Fewer adverse impacts than other available approaches.
- Lower costs.

5.8.9 Selection of Alternatives for Detailed Analysis

A decision will be made, based on the screening evaluation, as to which alternatives should be retained for further analysis. Alternatives selected for further evaluation should preserve a range of treatment and containment technologies initially developed. The alternatives selected for further evaluation will be agreed upon by the EPA and IDEM in a formal consultation. Procedures for evaluating, defining, and screening alternatives will be documented in the FS report showing the rationale behind the selection process.

5.8.10 Post-Screening Tasks

As a consequence of SARA, remediation of a site on the National Priorities List (NPL) is subject to cleanup standards as promulgated under all federal and state ARARs. An array of the alternatives that pass the screening level evaluation will be submitted to elicit the identification of ARARs so that detailed analysis of the individual alternatives may continue in the FS.

5.9 TASK 9 - Detailed Analysis of Alternatives

The detailed analysis of alternatives will provide a presentation of relevant information needed to allow a selection of a site remedy.

5.9.1 Alternative Definition

If necessary, each alternative will be further defined with respect to the volumes or areas of contaminated soil, groundwater, surface water, and sediment to be addressed, the technologies to be used, and any performance requirements associated with those technologies.

5.9.2 Individual Analysis of Alternatives

The alternatives that remain after the preliminary evaluation will be subjected to detailed analysis. The analysis will take into account overall protection to human health and the environment, compliance with ARARs, long-term effectiveness and permanence, reduction of toxicity, mobility, or volume, short-term effectiveness, implementability, cost, state acceptance, and commu-

Section No.: 5.0 Revision No.: 0 EPA Contract No. 68-W8-0093 Date: July 1990

nity acceptance. These factors are discussed in greater detail below. For purposes of budget development, it is assumed that up to four alternatives will be subjected to the detailed analyses described in Task 9.

Overall Protection of Human Health and the Environment

A final assessment will be made to check whether each alternative meets the requirement that it is protective of human health and the environment. The emphasis of this analysis is on long-term effectiveness and permanence, shortterm effectiveness, and compliance with ARARs.

Compliance with ARARs

Federal and state responses to the alternatives array submittal will be considered in the detailed analysis of alternatives. Each alternative will be analyzed in view of the contaminant-specific, action-specific, and locationspecific requirements identified during ARAR review.

Long-Term Effectiveness and Performance Evaluation

Long-term effectiveness addresses the results of the remedial action in terms of residual risk after response objectives have been met. The components of long-term effectiveness will be identified for each alternative as follows:

- Magnitude of remaining risk from untreated water or treatment residuals.
- The adequacy and suitability of controls that are used to manage treatment residuals or untreated wastes.
- The long-term reliability of management controls for providing continued protection from residuals.

Reduction of Toxicity, Mobility, or Volume through Treatment

Contaminant reduction will aim to reduce the mobility, toxicity, or volume of the contaminants. The analysis should favor treatment technologies that produce permanent solutions, such as alternative treatment technologies or resource recovery technologies.

Short-Term Effectiveness Evaluation

Short-term effectiveness includes the effectiveness of the alternatives during construction and implementation phases until remedial response objectives are met.

Protective measures will be evaluated for the following areas of concern:

Protection of surrounding community and environment and site workers during construction of the alternative.

Section No.: 5.0 Revision No.: 0 EPA Contract No. 68-W8-0093 Date: July 1990

State Acceptance

This section of the detailed evaluation is limited to the analysis of formal comments made by the IDEM during previous phases of the RI/FS. Documentation in the FS report will include such details as meetings, opportunities for agency review, and transmittal of comments between the EPA and IDEM.

Community Acceptance

This section is used to address those features of the alternatives the community supports, has reservations about, or opposes.

5.9.3 Comparative Evaluation of Acceptable Alternatives

The analysis performed for each alternative will be aggregated in order to rank alternatives and support a recommendation. The relative performance of each alternative will be evaluated in relation to each specific evaluation criterion. The advantages and disadvantages of each alternative relative to one another will be identified. The comparative analysis of the alternatives will be presented in a narrative discussion and will include a description of the following:

- Strengths and weaknesses of the alternatives relative to one another with respect to each criterion.
- How reasonable variations of key uncertainties could change the expectations of their relative performance.
- Differences among the alternatives measured either qualitatively or quantitatively.
- Substantive differences among the alternatives.

Innovative technologies shall include a description of their potential advantages in cost or performance and the degree of uncertainty in their expected performance.

The ranking system provides each consideration a weight to allow a cost/benefit analysis to be performed. Incremental cost/benefit analysis and decision analysis are each described below.

5.9.4 Cost-Effectiveness Analysis

A cost/benefit (C/B) analysis may be performed on the alternatives so that selection of an alternative can be made that provides the most cost-effective alternative with a favorable balance between protection of public health, welfare, and the environment. The C/B analysis contains potential synergistic considerations of the sensitivity analysis.

Protection of community and environment from hazardous substances remaining after implementation of the alternative.

Section No.: 5.0

Revision No.: 0

Date: July 1990

Protection of workers during operation and maintenance of the alternative.

Implementability

Implementation analysis will review the technical and administrative feasibility of the alternative along with the availability of the system.

Technical Feasibility

Technical feasibility will consider:

- Constructability of the technology.
- Relation to additional remedial action.
- Ability to monitor the effectiveness of the remedy.
- Maintainability of equipment.

Administrative Feasibility

Administrative feasibility will examine the likelihood of favorable community response and the ability of related agencies to obtain approval for site access and to coordinate activity related to the project.

System Availability

The review of system availability will indicate whether or not the necessary equipment and specialists are available. If the solution requires long-term operation of a treatment, storage, and disposal (TSD) service, then the review must assure that long-term capacity will be available.

Cost

The financial analysis will consider the cost associated with the following aspects of the project:

- Capital costs associated with development and construction.
- Operation and maintenance.
- Present-worth analysis.

Section No.: 5.0 Revision No.: 0 EPA Contract No. 68-W8-0093 Date: July 1990

5.9.5 <u>Decision Analysis (Sensitivity Analysis)</u>

A sensitivity analysis in conjunction with a C/B analysis may be used to screen the alternatives for selection. The variables are analyzed as to their weight (criticalness) in allowing an alternative to be viable.

5.10 TASK 10 - FEASIBILITY STUDY (FS) REPORT

5.10.1 Draft FS Report

The draft FS report will summarize data developed during the alternative remedial actions assessment process. The draft FS report will be submitted to EPA and other appropriate agencies for comment. The draft FS report will support EPA needs during the public comment period before EPA development of the Record of Decision (ROD).

5.10.2 Public Meeting

There will be a period for public comment on the draft FS report. EPA Region V staff may hold a public meeting during this comment period to receive comments and answer questions on the recommended remedial alternative. Donohue will assist EPA in answering questions received during the public hearing and review phase and will consider the questions in the final report.

5.10.3 Final FS Report

Following the public comment period, and only if public comments require additional changes to the draft FS report, the final FS report will be submitted for EPA approval.

5.11 TASK 11 - ENFORCEMENT SUPPORT

5.11.1 104(e) Notice Support

The Donohue team will collect the approximately 200 responses to 104 (e) notices from EPA and accompanying preliminary tracking system. The team will also review CERCLA PRP background and 104(e) notices for more detail than has been collected in the preliminary tracking system. Each facility will be evaluated to determine what wastes are generated from the facility's processes. In addition, it will be determined if the wastes generated by each facility correspond to the contaminants of concern at the landfill. Data and information to determine responsible parties will be analyzed.

A database will be developed with adequate detail and organized in a systematic method. The database to be used will be PRP base developed for EPA to assist a PRP search. A QA/QC check of data entry will be provided.

Himco Dump RI/FS Final Work Plan

Section No.: 5.0 Revision No.: 0 EPA Contract No. 68-W8-0093 Date: July 1990

5.11.2 Negotiation Meetings

Donohue will assist EPA by attending negotiation meetings.

5.11.3 Briefing Materials

Donohue will assist EPA by preparing briefing materials, and assist in the preparation of any enforcement decision documents.

5.11.4 Historical Ownership of Landfill Property

The Donohue team will collect and assimilate data to determine historical ownership of the Himco Dump property. The work will include a history of growth and property ownership of the landfill over time by conducting a deed of records search, preparing auditors maps, and reviewing aerial photographs. A title search will be conducted over a period of 40 years (from 1950 to 1990), by a title insurance firm. The title insurance firm will be requested to provide a complete search showing all transfers. Thus a search may be conducted not only of the Elkhart County tract index, but also of the more detailed grantor/grantee index. Using the legal descriptions collected, auditor's maps will be drawn for each change in ownership. Four Aerial photographs have been obtained from the EPA which span a period of 35 years including 1951, 1965, 1973, and 1986. If available, additional aerial photographs will be obtained for the period of the dump's operation (1960-1976). An analysis of the aerial photographs will be used to develop a history of growth of the landfill. The auditor's maps and the aerial photographs will be used in conjunction to determine owners of record over operating portions of the landfill.

5.12 ADMINISTRATIVE RECORD

Donohue will collaborate with the EPA Administrative Record Coordinator (ARC) in maintaining the administrative record for the Himco Dump RI/FS. For budgeting purposes, we are assuming two separate record files, one at the EPA Region V offices and one at or near the Himco Dump site. We are also assuming that the EPA ARC will ensure that the necessary EPA files are made available; make the initial contact with the custodian of the site record file; perform a regular quality assurance check on the index and the EPA and site record file; make the EPA record file available to the public for review; and certify the administrative record for legal purposes. In addition, we are assuming that the EPA Office of Public Affairs will select the location for the site record file and publish the notice of its availability in local papers.

Donohue will perform the following activities related to establishing and maintaining the Himco Dump RI/FS administrative record:

Contact the RPM and the appropriate EPA attorney for review of their files and work with them to identify the documents which should be included in the administrative record.

Develop a draft index according the EPA's "Interim Guidance on Administrative Records for the Selection of CERCLA Response Actions." The index will list the documents by title, author, recipient, date, and pages.

Section No.: 5.0

Revision No.: 0

Date: July 1990

- Submit the draft index to the RPM, attorney, and ARC for review and approval.
- Make two hard copies of all documents, one for the site record file and one for the EPA file. At this time, estimated LOE and costs do not provide for microfiching; however, if this is an EPA preference, we will revise our estimate for the final Work Plan.
- Update the site and EPA record files and index once a quarter, including reproduction of documents, coordination with the site repository custodian, and trips to and from EPA Region V offices to pick up and deliver administrative record documents.
- Assist EPA in final quality assurance check of the administrative record before the Record of Decision is signed.

5.13 PROJECT MANAGEMENT

The Donohue Site Manager will be responsible for coordinating and monitoring the daily activities on the project. Primary responsibilities will be to:

- Serve as the principal contact with EPA.
- Ensure that the project is appropriately staffed, identify staffing problems, and coordinate resolution of problems with the Donohue ARCS Project Manager.
- Monitor budget and schedule, identify any variances, and take appropriate corrective action.
- Provide overall project direction and resolve problem areas.
- Conduct and attend project review meetings.
- Observe and report on the appropriate implementation of quality assurance and safety programs.
- Prepare a monthly site-specific progress report throughout the course of the project. The monthly report will be submitted to the RPM on the 20th day of the following month and will contain the information required by Donohue's prime contract with U.S. EPA.

5-14

6.0 COSTS AND KEY ASSUMPTIONS

Section No.: 6.0

Revision No.: 0
Date: July 1990

Volume 1B, "Contract Pricing Proposal," presents estimated costs and level of effort (LOE) for performance of RI/FS standard tasks as defined in the EPA Statement of Work. Costs and LOE associated with project and task management and with technical quality assurance are included in each standard task. Costs and LOE associated with procuring subcontractors are included in the task in which the subcontractor will perform work. No costs or LOE are included at this time for Task 6, "Treatability Studies"; the necessity for treatability studies will be determined after the RI results are evaluated and the development and screening phases of the FS are completed.

Cost estimates are based on the assumption that health and safety personal protective equipment requirements for outside sampling activities are for Level D with upgrade to Level C. Staff involved in test pit excavation will be in Level B. If the level of protection must be upgraded, increased costs will be incurred. Cost estimates for the Phase II RI are based on the assumptions that a contaminant source and jurisdictional wetlands will be found in Phase I and that releases to surface water, groundwater, sediment, and air have occurred.

The cost estimates are based on the assumption that the proposed project schedule can be realized. If climatic, budgetary, or technical circumstances require separate mobilizations for activities presently scheduled to occur concurrently, increased costs will be incurred. Likewise, if EPA authorization to proceed or legal access to sampling locations are not provided such that pre-mobilization subcontracting arrangements and/or sampling plan modifications can be accomplished, the schedule will be affected and additional costs may be incurred.

Volume 1B of this Work Plan contains all cost details, including:

- Detailed descriptions of cost elements (Optional Form 60).
- 2. Estimated dollar costs for the Himco Dump RI/FS broken down by phase and subtask as well as by labor, travel, equipment, computer, reports, miscellaneous, and subcontractor's categories (Detailed Cost Estimate Distributions).
- Tabulations of estimated hours for the Himco Dump RI/FS by labor category apportioned by subtask (Labor Workhour Distribution Tables).
- 4. Key assumptions.

Subcontracts anticipated for the Himco Dump RI/FS are summarized in Table 6-1.

Section No.: 6.0 Revision No.: 0 Date: July 1990

TABLE 6-1

ANTICIPATED SUBCONTRACTS Himco Dump RI/FS

Activity	Team Subcontractor	Pool Subcontractor
Aerial Survey		
Field Survey		x x
Drilling & Test Pit Excavation (Monitoring Well Installation)		x
Baseline Risk Assessment	x	
Purge Water Storage/Hauling		- X
Cone Penetrometer Test		x

7.0 SCHEDULE

Section No.: 7.0

Revision No.: 0

Date: July 1990

The schedule for the Himco Dump RI/FS is presented in Appendix D. This schedule shows activities for standard tasks as defined in the EPA Statement of Work. Community relations activities will be carried out throughout the course of the RI/FS under a separate work assignment. Project management activities will also be conducted concurrently. No activities are scheduled at this time for Task 6, "Treatability Studies"; the necessity for treatability studies will be determined after the RI results are evaluated.

This schedule has been developed to accomplish the proposed field investigations using an efficient and cost-effective strategy. Mobilization, sampling sequences, and field team responsibilities have been planned to maximize efficiency of personnel use, pre-mobilization arrangements, and field data pre-requisites.

The project schedule is based on the following assumptions:

- Access to specific sampling sites will be provided by EPA before the start of the scheduled field work for a specific medium.
- Donohue will be able to secure a six-week turnaround time for sample analysis. Donohue will be provided with all analytical results after they are validated by EPA. The schedule is based on a CLP analysis time of 40 days and a CLP validation time (by EPA) of 3 weeks.
- The health and safety personal protective requirements are Level D with upgrade to Level C, with the exception of test pit excavation which will be conducted in Level B.

Revision No.: 0

Date: July 1990

Section No.: 8.0

8.0 PROJECT MANAGEMENT

8.1 ORGANIZATION

The proposed project organization is shown on Figure 8-1. The Donohue Project Manager (PM), Mr. Roman Gau, is responsible for the quality of all ARCS work performed by Donohue in Region V. He monitors the progress of each work assignment to ensure that adequate resources are available and that major problems are prevented or minimized. Mr. Gau implements the program standard of quality for work in the Region. The PM's review concentrates on the technical quality, schedule, and cost for all work assignments.

The Site Manager (SM) (Vanessa A. Harris) has primary responsibility and authority for implementing and executing the RI/FS. Supporting the SM are the RI Leader, FS Leader, QA Team Leader, and Health and Safety Officer (HSO). The RI Leader is responsible for performance of the RI and for the preparation of the RI report. The FS Leader is responsible for performance of the FS, treatability studies if required, and the preparation of the FS report. The HSO is responsible for all health and safety activities at the site, including site safety inspections, procuring safety equipment, and preparing the site-specific Health and Safety Plan. The Community Relations (CR) Manager will conduct CR activities as part of a separate work assignment, but will collaborate closely with the SM.

8.2 REPORTING

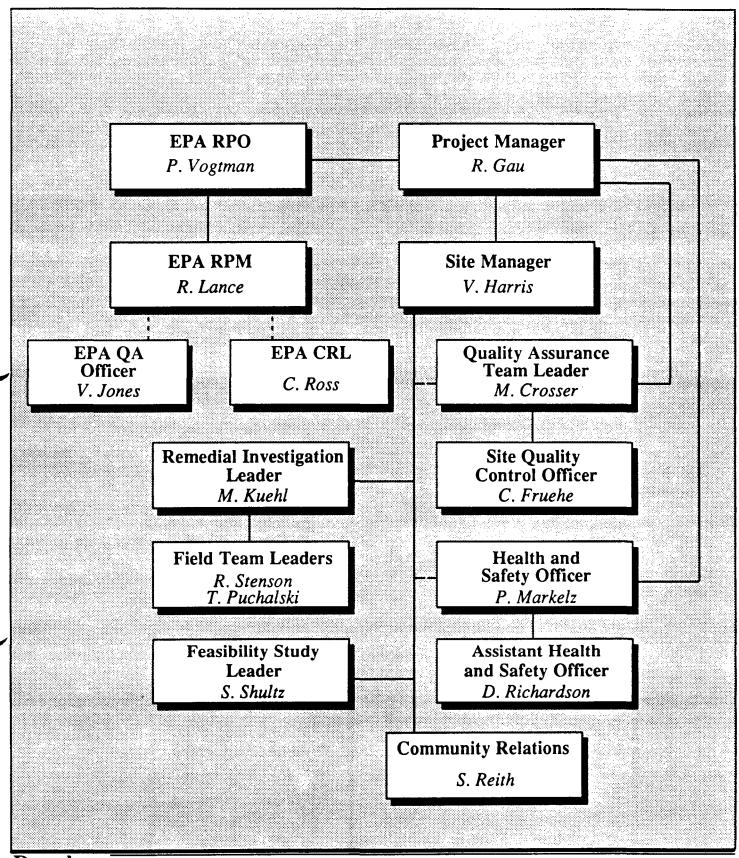
The Donohue ARCS Draft Project Management Plan (Donohue 1988) provides for planning and monitoring of team activities and coordination with EPA. Frequent and regular contact with the EPA RPM will be maintained by Donohue's SM to assure full communication throughout the project. In addition, this plan describes appropriate review of the financial, schedule, and technical status of the work assignment.

Monthly progress reports will be prepared and submitted to EPA outlining target and actual completion dates, and discussing problems and resolutions regarding both technical and financial issues. The monthly progress reports will be submitted to the EPA within 20 calendar days after the end of each reporting period and will consist of a summary of work completed during that period, current and anticipated costs, and scheduling information.

The task numbering system for the Himco Dump RI/FS will follow the standard tasks listed in the EPA Statement of Work. Each of these tasks will be scheduled and tracked separately during the course of the RI/FS. The tasks are numbered as follows:

Task 1 Project Planning

Task 2 Field Investigations



Donohue

June 1990

PROJECT ORGANIZATION

HIMCO DUMP ELKHART, INDIANA

Engineers Architects Scientists

FIGURE 8-1

Section No.: 8.0 Revision No.: 0 Date: July 1990

- Task 3 Sample Analyses/Validation
- Task 4 Data Evaluation
- Task 5 Risk Assessment
- Task 6 Treatability Studies
- Task 7 Remedial Investigation Report(s)
- Task 8 Remedial Alternatives Development and Screening
- Task 9 Detailed Analysis of Alternatives
- Task 10 Feasibility Study Report(s)

Project control meetings will be held, as needed, to evaluate project status, discuss current items of interest, and review major deliverables.

8.3 QUALITY ASSURANCE AND DOCUMENT CONTROL

Quality control will be maintained by a Donohue Technical Advisory Committee (TAC) composed of senior technical advisors who have been organized under the direction of the Technical Services/Quality Assurance Manager (TSQAM). Appropriate members of the TAC will be involved in all phases of the work assignment, from planning through execution and delivery. The TAC will review all deliverables and will be available to the SM and project team personnel, as necessary, particularly to communicate changes resulting from revised EPA guidance, or relevant advances in technology applicable to the Himco Dump site.

Draft site-specific quality assurance requirements will be in accordance with the Quality Assurance Project Plan for the ARCS Program as approved by EPA.

Document control aspects of the project pertain to controlling and filing documents. Internal ARCS program filing system guidelines have been developed that conform to the requirements of the EPA to ensure that documents are properly stored and filed. This guideline will be implemented to control and file all documents associated with the Himco Dump RI/FS. The system includes document receipt control procedures, a file review and inspection system, and security measures.

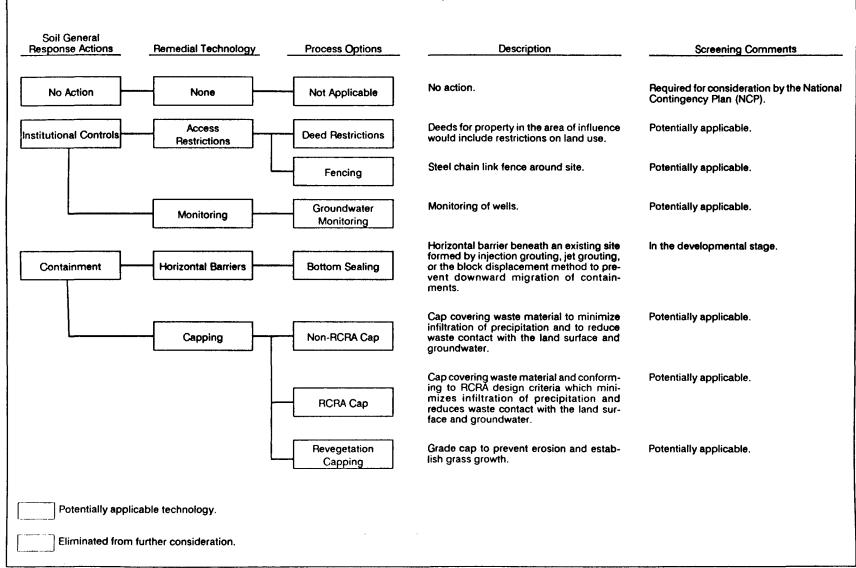
ARCS/P/HIMCO/AF8

APPENDIX A

Preliminary Screening of Technologies and Process Options

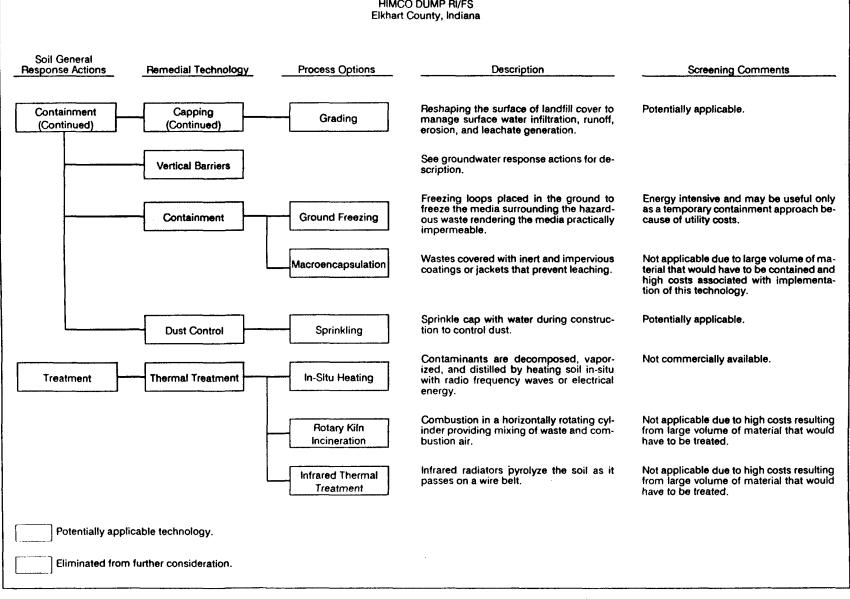
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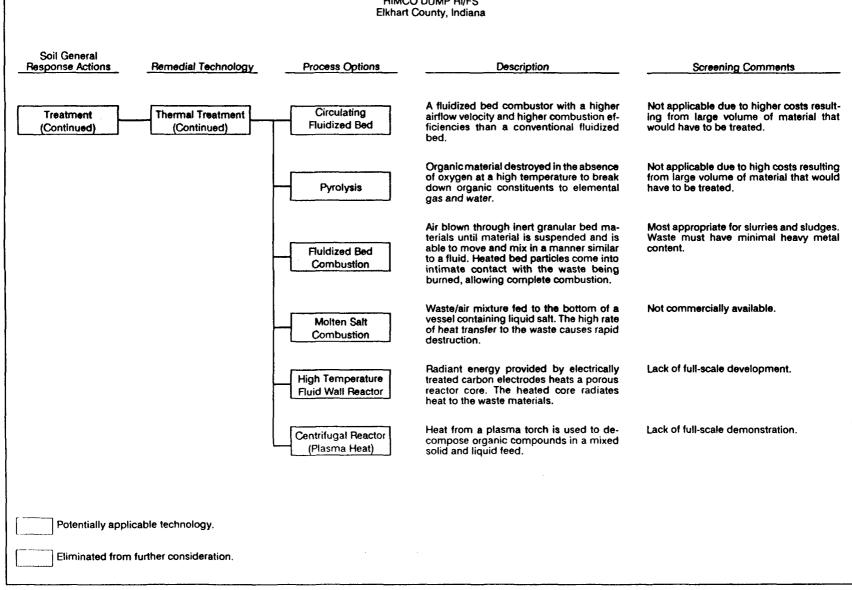
FIGURE 1 PRELIMINARY SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS HIMCO DUMP RI/FS Elkhart County, Indiana



2 of 28

FIGURE 1 PRELIMINARY SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS HIMCO DUMP RI/FS Elkhart County, Indiana





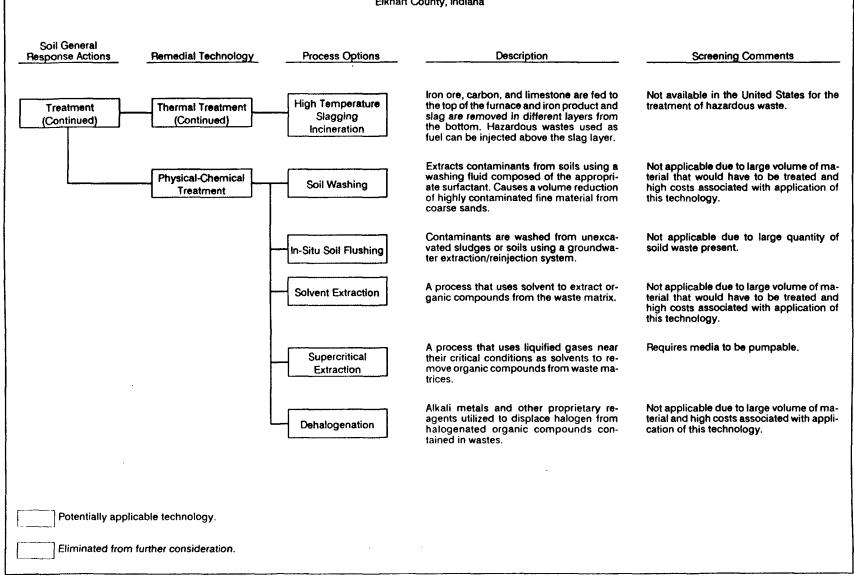
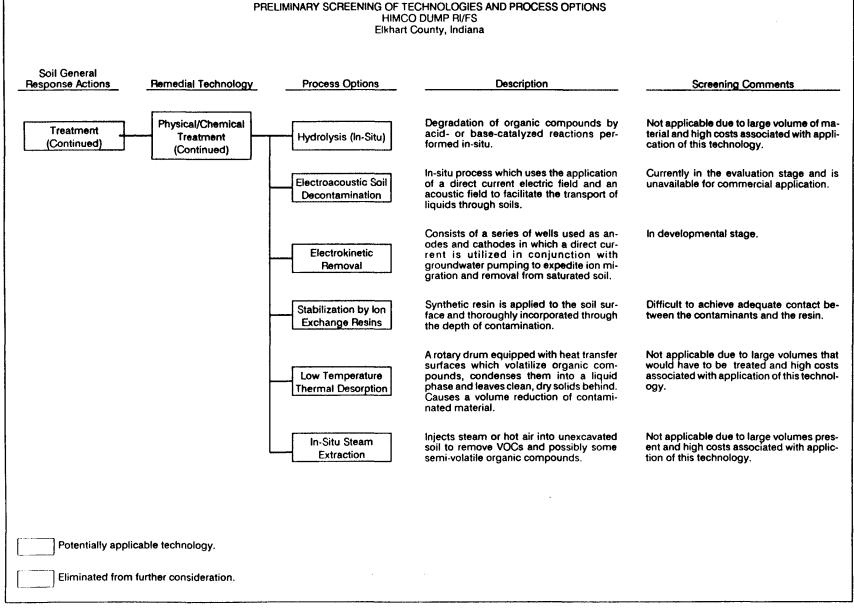
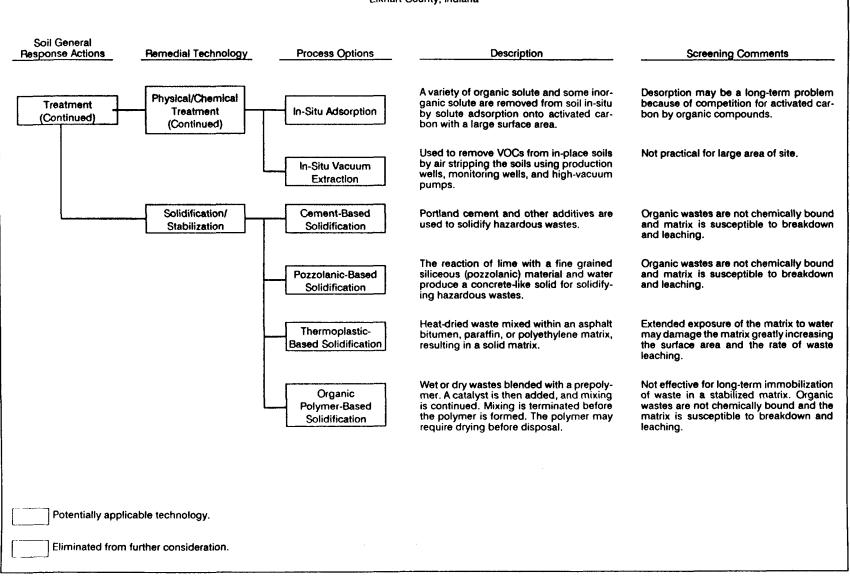
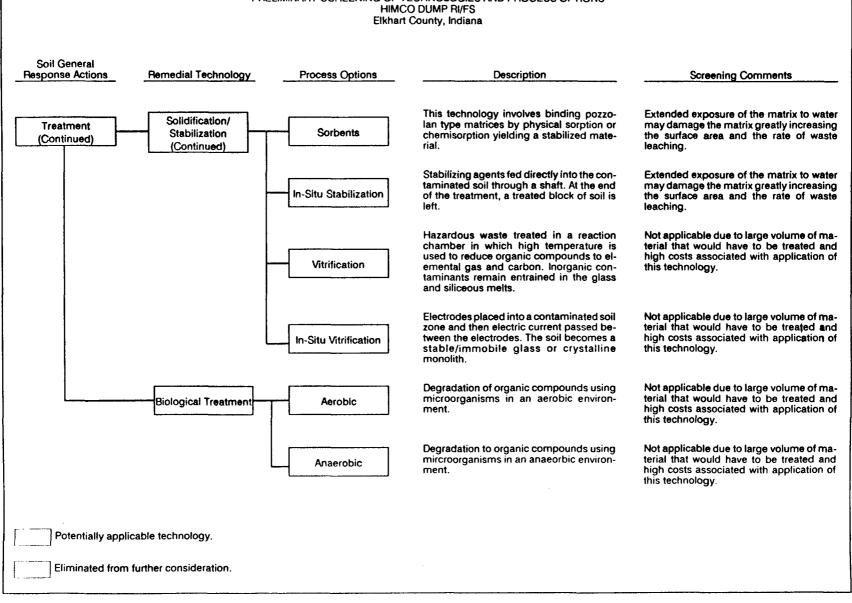
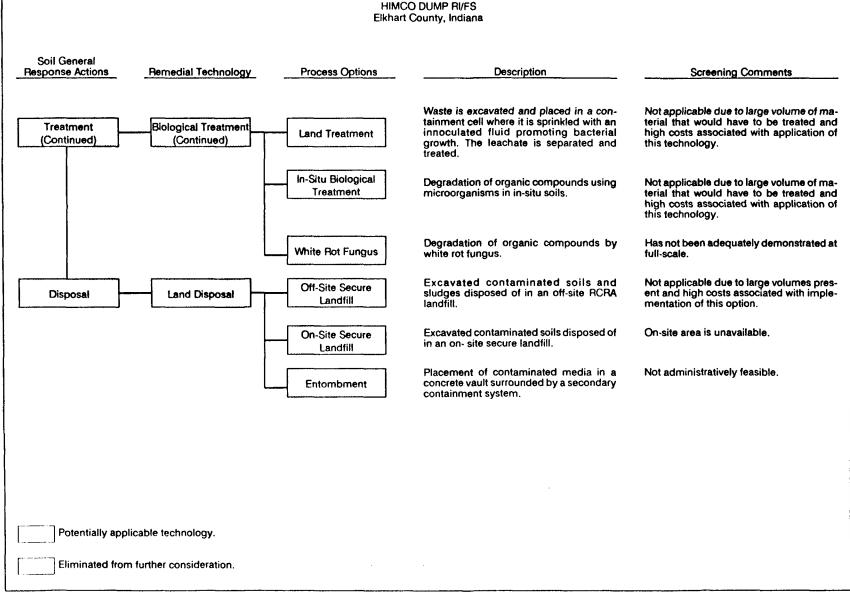


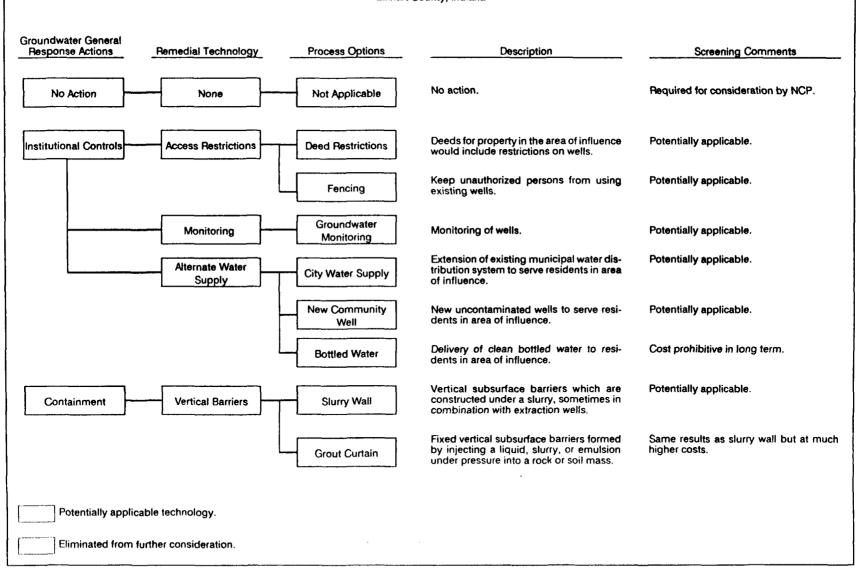
FIGURE 1 HIMCO DUMP RI/FS



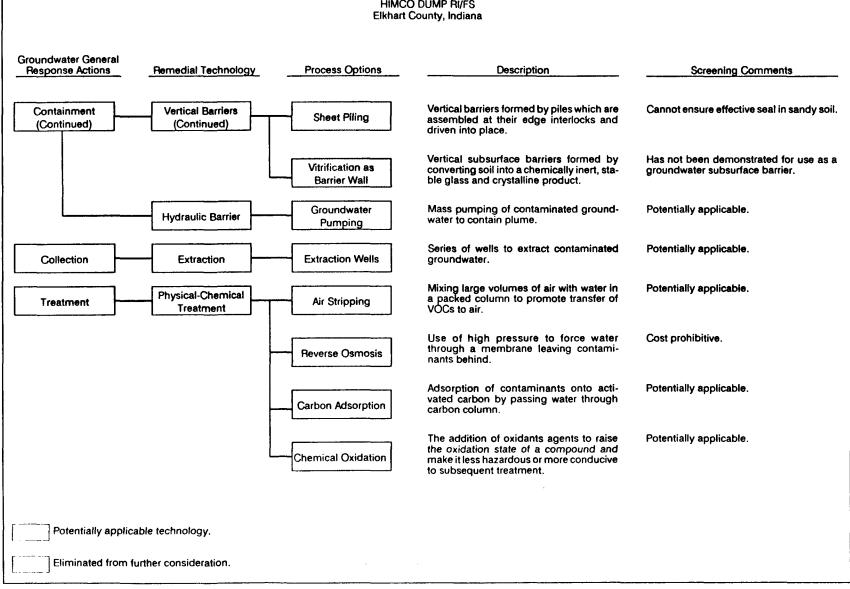












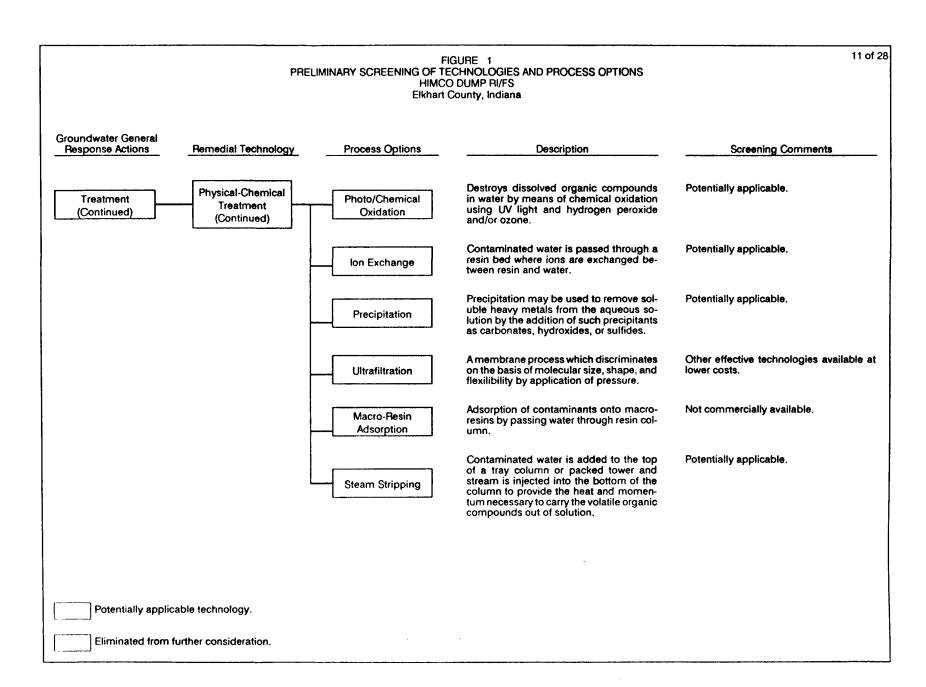
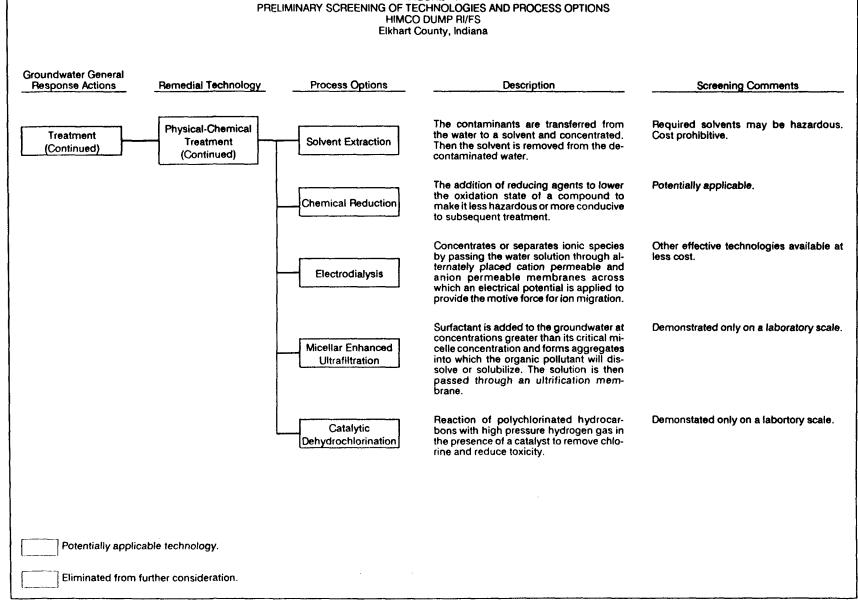
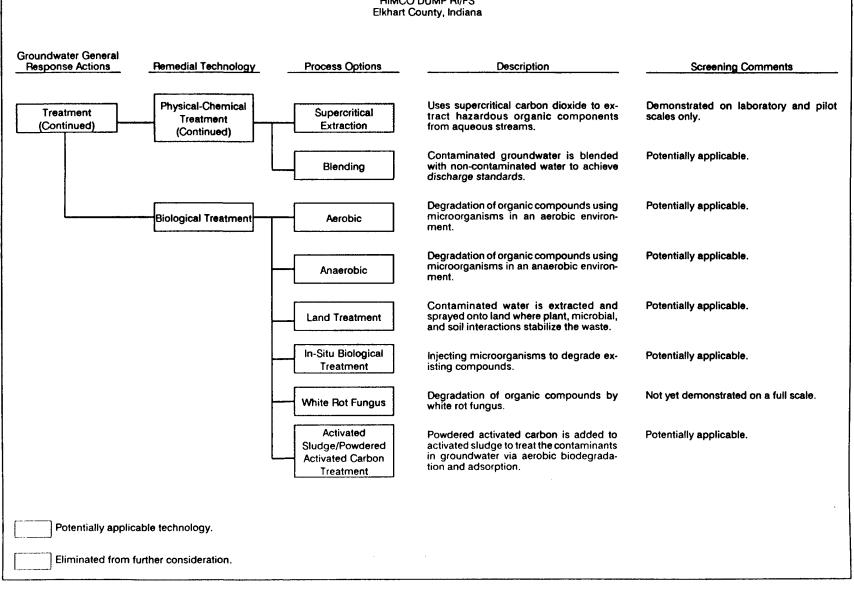


FIGURE 1 HIMCO DUMP RI/FS







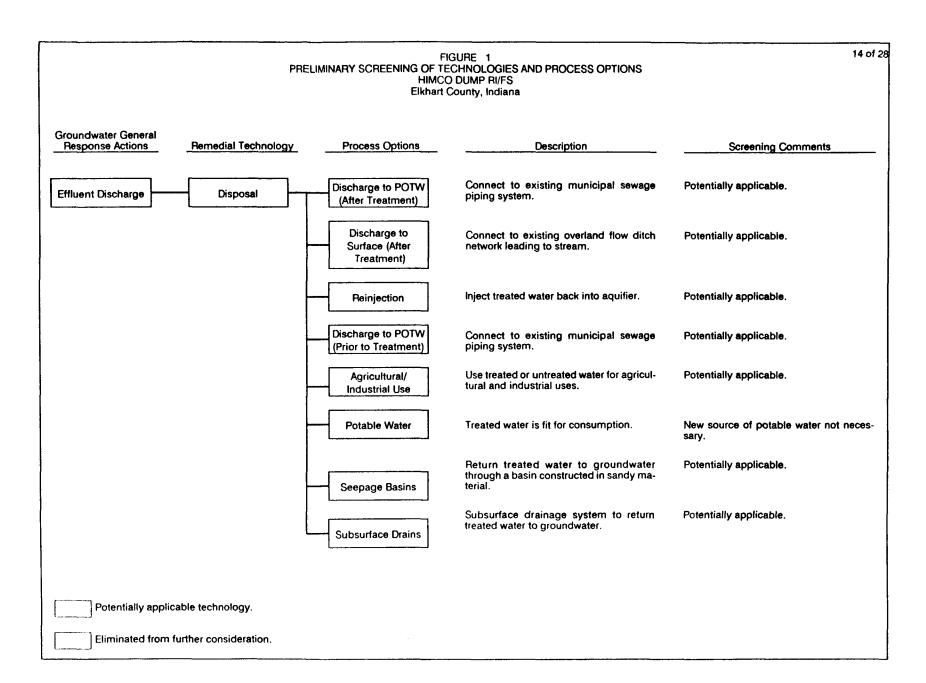


	FIGURE 1 PRELIMINARY SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS HIMCO DUMP RI/FS Elkhart County, Indiana			15 of 28	
Groundwater General Response Actions	Remedial Technology	Process Options	Description	Screening Comments	
Effluent Discharge (Continued)	Disposal (Continued)	Temporary Storage	Water stored temporarily after treatment.	Potentially applicable.	
Potentially applicable technology.					
Eliminated from further consideration.					

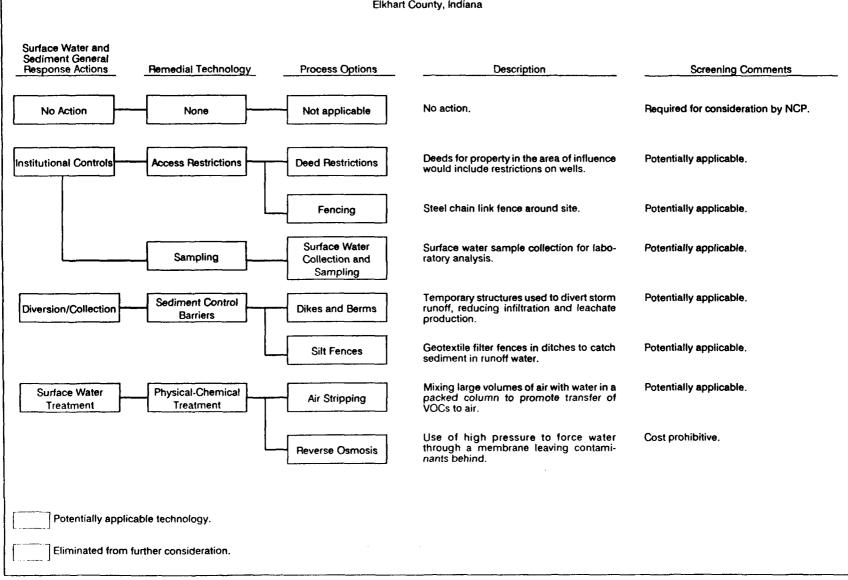
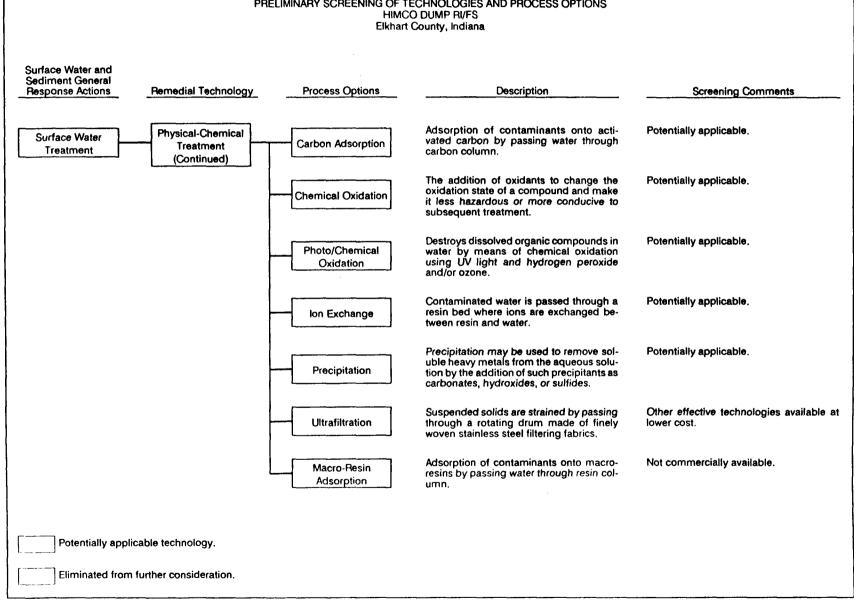
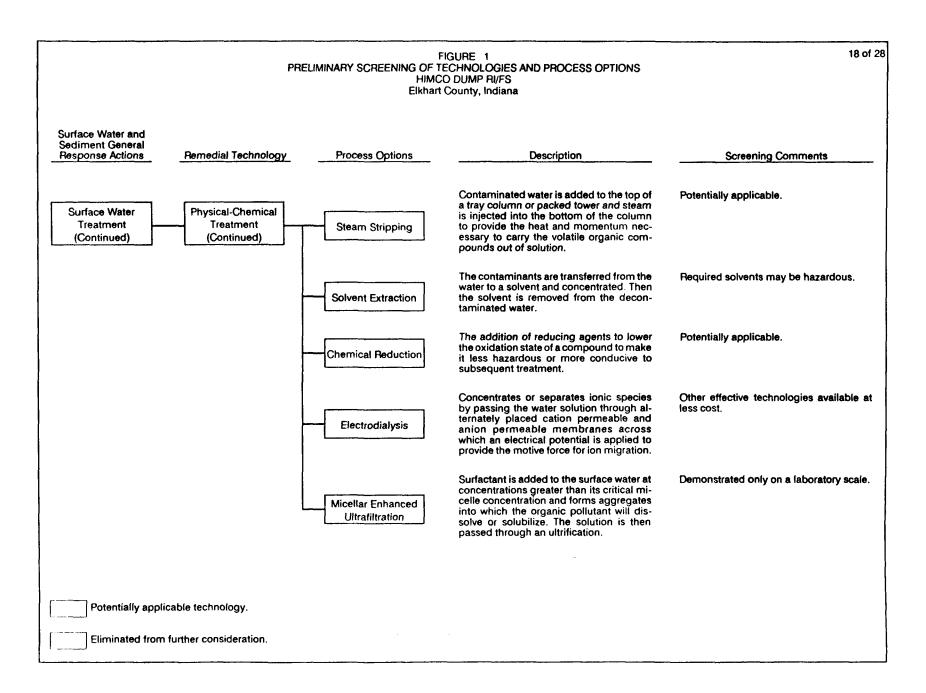


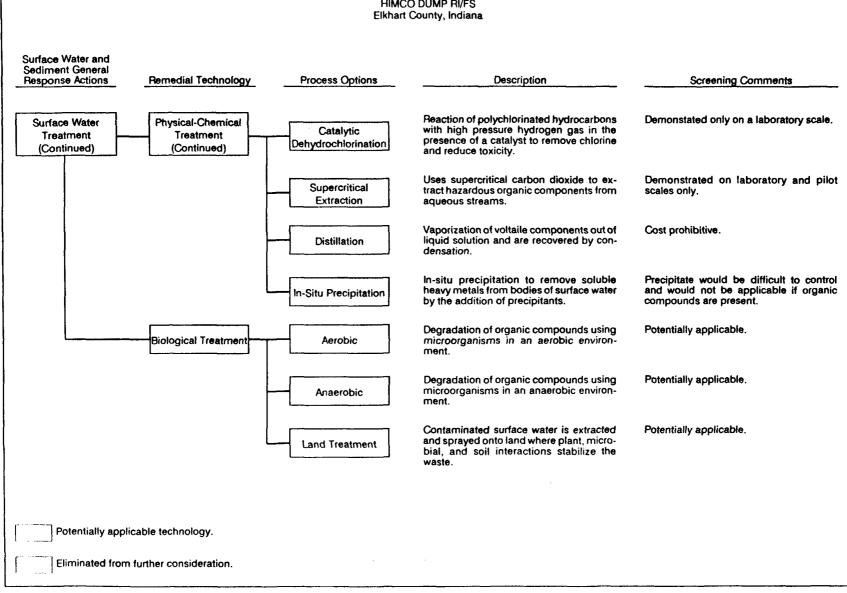


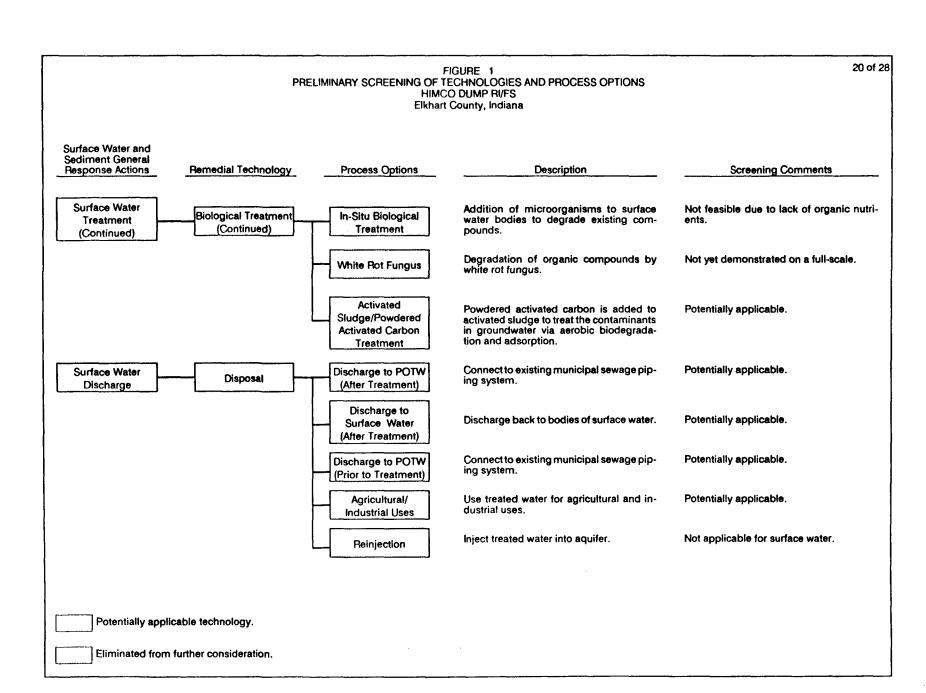
FIGURE 1 PRELIMINARY SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS HIMCO DUMP RI/FS











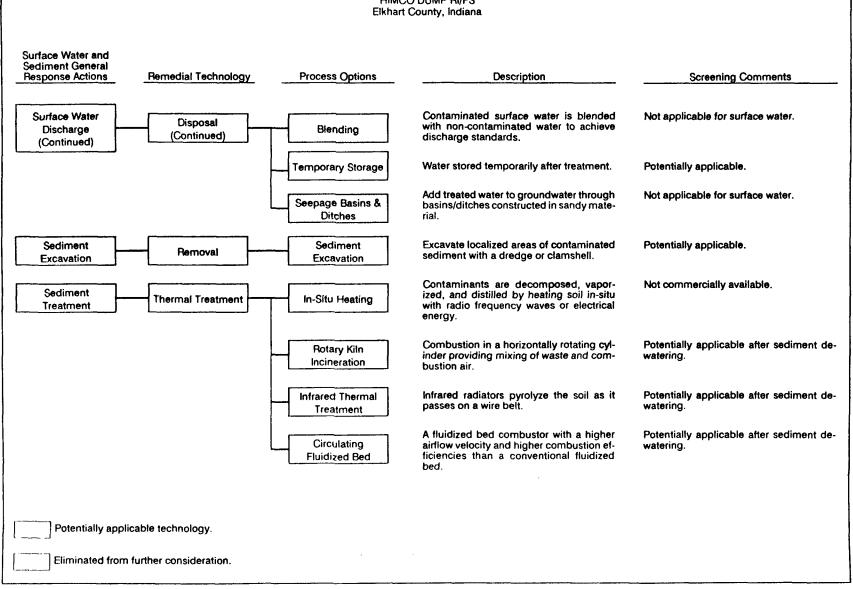
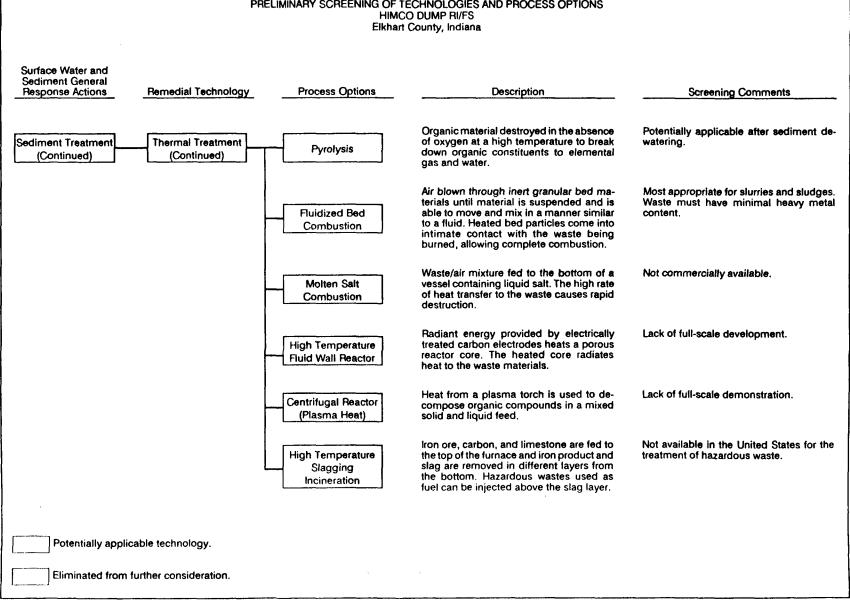
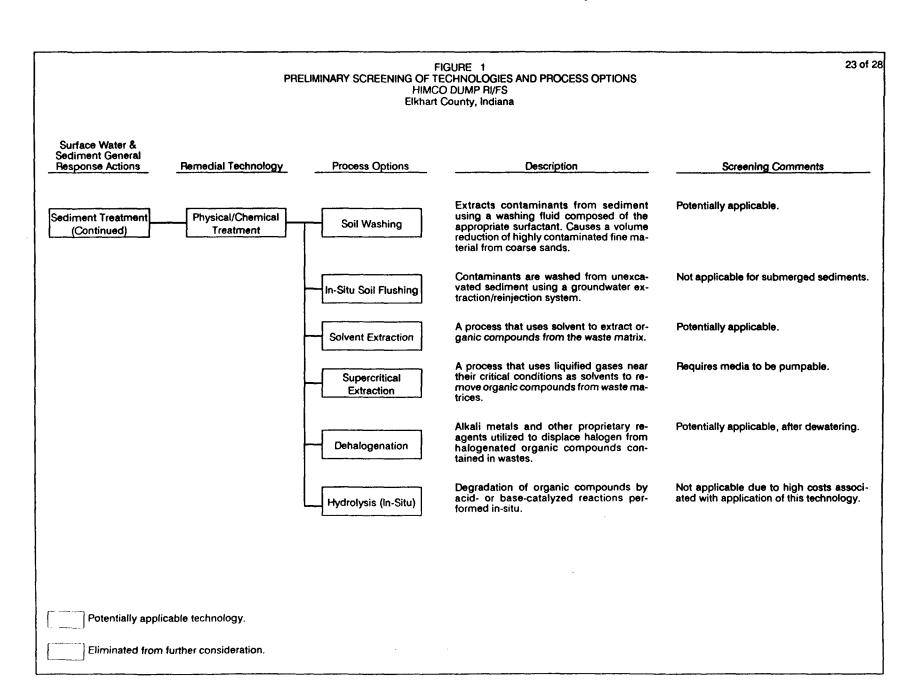


FIGURE 1 PRELIMINARY SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS HIMCO DUMP RI/FS





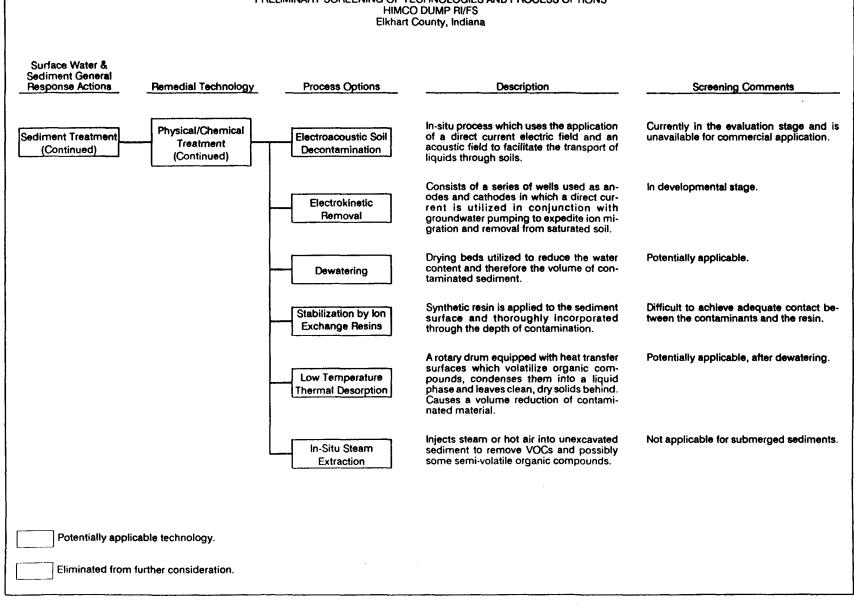
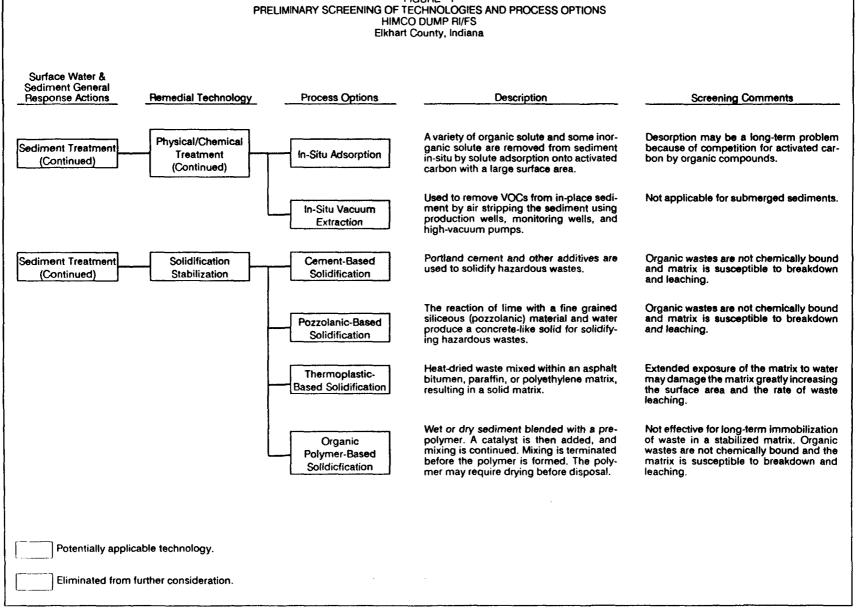
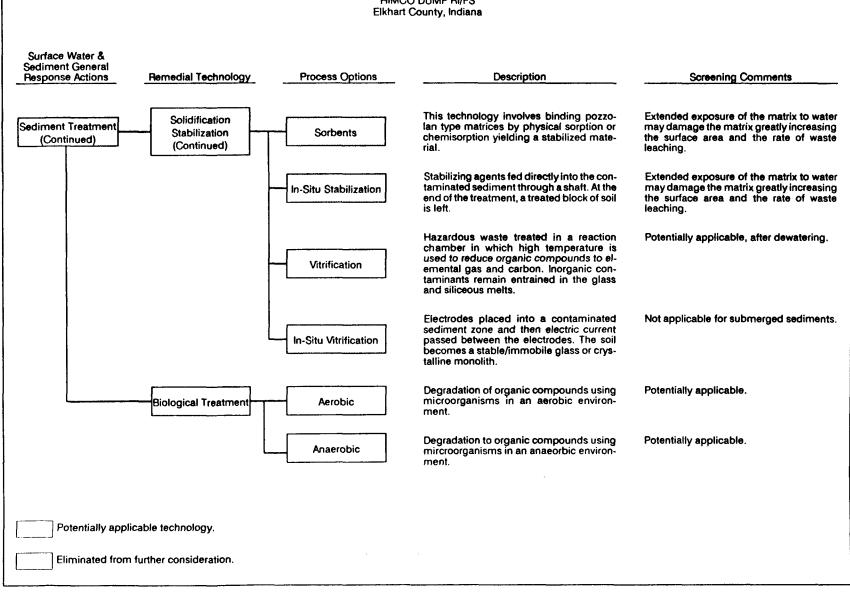


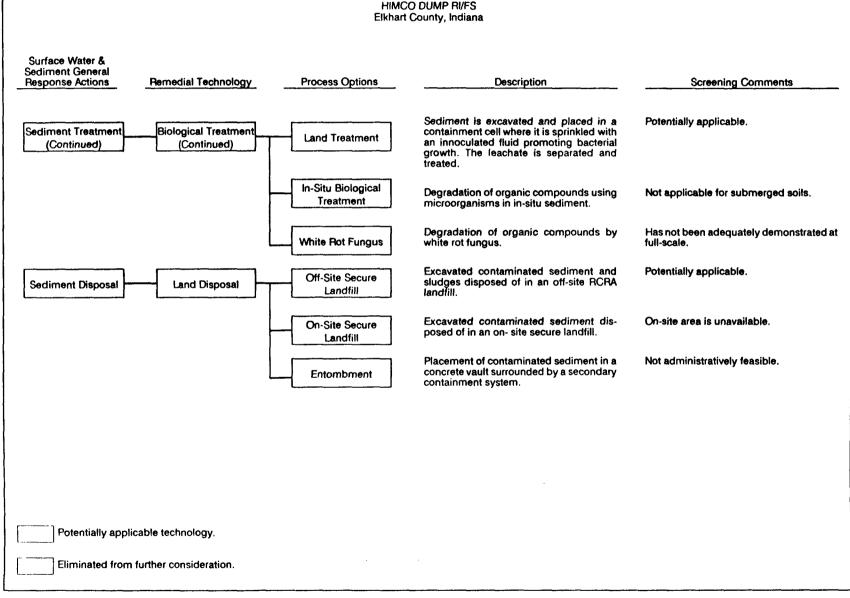


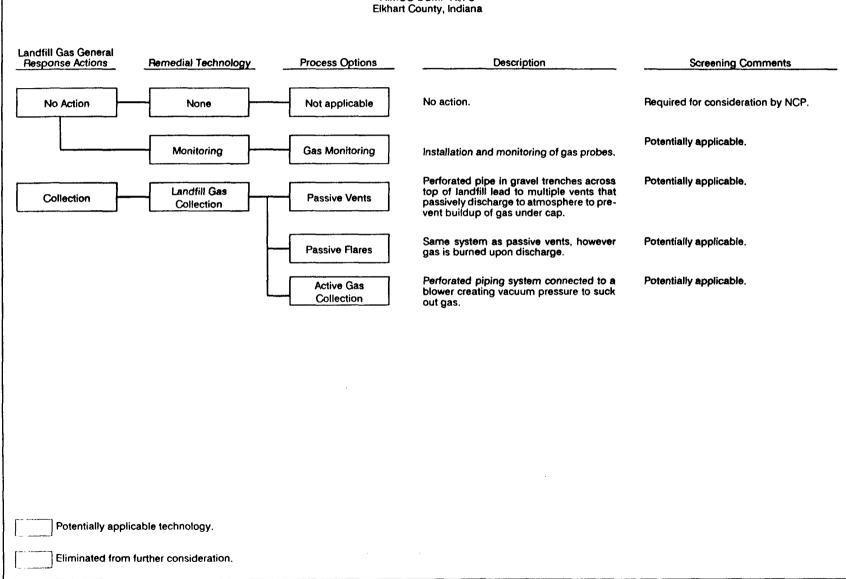
FIGURE 1 HIMCO DUMP RI/FS











APPENDIX B

Endangerment Assessment Plan

Submitted to:

Donohue & Associates, Inc. 111 N. Canal Street, Suite 305 Chicago, IL 60606

Attention: Mr. James Garvin, Project Manager (1 copy)
Ms. Vanessa Harris, Site Manager (1 copy)

TR-1107-9

ENDANGERMENT ASSESSMENT WORK PLAN

Himco Dump Site

Prepared Under

Program No. 1522

for

Subcontract No. 68-W8-0093-D

Under

Contract No. 68-W8-0093

for

ICAIR Work Assignment No. 101522

Donohue Work Assignment No. 17-5L4J

TABLE OF CONTENTS

		PAGE
LIST	OF ACRONYMS	ii
1.0	INTRODUCTION	1
2.0	PROJECT PLANNING (RI/FS TASK 1)	1
3.0	RISK ASSESSMENT (RI/FS TASK 6)	2
	3.1 Baseline Risk Assessment	2
	3.1.1 Data Evaluation	2 3 4 4
	3.2 Conclusions and Uncertainties	4 4 5
4.0	REMEDIAL INVESTIGATION REPORTS (RI/FS TASK 8)	5
5.0	REMEDIAL ALTERNATIVES DEVELOPMENT/SCREENING (RI/FS TASK 9)	5
6.0	DETAILED ANALYSIS OF ALTERNATIVES (RI/FS TASK 10)	8
7.0	FEASIBILITY STUDY REPORTS (RI/FS TASK 11)	8
8.0	REFERENCES	8
	LIST OF TABLES	
TABLE		PAGE
1	Outline for Endangerment Assessment	6

LIST OF ACRONYMS

ARAR	Applicable or Relevant and Appropriate		
	Requirement		
CERCLA	Comprehensive Environmental Response,		
	Compensation and Liability Act		
DQO	Data Quality Objective		
EA	Endangerment Assessment		
EPA	Environmental Protection Agency		
FS	Feasibility Study		
FSP	Field Sampling Plan		
HEAST	Health Effects Assessment Summary Tables		
HHEM	Human Health Evaluation Manual		
IRIS	Integrated Risk Information System		
QAPP	Quality Assurance Project Plan		
RI	Remedial Investigation		
RME	Reasonable Maximum Exposure		
SAP	Sampling and Analysis Plan		

1.0 INTRODUCTION

This Endangerment Assessment (EA) Work Plan is a detailed approach for evaluating human health risks at the Himco Dump Site for development of a baseline risk assessment and for tasks related to risk assessment throughout the Remedial Investigation/Feasibility Study (RI/FS) process. There are tasks and subsequent decisions made prior to performing the actual risk assessment which subsequently affect the risk assessment phase. These have been documented in the following sections and cross-referenced (in parentheses) to the standard work plan tasks described in the Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (USEPA 1988a). The tasks described in this work plan will be performed by ICAIR, Life Systems.

The risk assessment tasks included in this work plan will be conducted according to guidance found in the following documents:

- Risk Assessment Guidance for Superfund. Human Health Evaluation Manual (USEPA 1989d)
- Risk Assessment Guidance for Superfund. Environmental Evaluation Manual (USEPA 1989e)
- Superfund Exposure Assessment Manual (USEPA 1988b)
- Exposure Factors Handbook (USEPA 1989b)

This work plan is organized into eight sections. Section 2.0 through 7.0 address individual RI/FS work plan tasks. Section 8.0 provides a listing of references used in preparation of this work plan.

2.0 PROJECT PLANNING (RI/FS TASK 1)

Addressing risk assessment requirements during project planning for the RI/FS is an essential element of the planning process. Sampling decisions made during project planning can affect and impact risk assessment decisions that will be made later. Lack of data or incomplete data for all complete exposure pathways can dramatically increase the uncertainty of risk estimates. These estimates may be difficult to defend if challenged by public or private parties, possibly resulting in resampling and analysis thereby severely impacting cost and schedule. In response to these requirements, input into the planning process will be provided during the project planning phase and in subsequent discussions and meetings with the site manager. Topics to be reviewed include:

- Conceptual site model
- Sampling and analysis strategies
- Data quality objectives (DQOs)

The planning process discussed above will culminate in the development of the sampling and analysis plan (SAP) consisting of a quality assurance project plan (QAPP) and a field sampling plan (FSP). Therefore, a review of the SAP by the risk assessors is critical. A review of the plans will be conducted to determine the adequacy of the proposed data collection, specifically as to the following:

- Each medium of concern at the site
- Background samples and concentrations
- All potential exposure points within each medium
- Migration to potential exposure points
- Potentially exposed populations
- Potential exposure based on possible future land uses
- Sufficient data to satisfy concerns about distributions of sampling data and statistics
- Number and location of samples

Identification of any data gaps will be documented in a Technical Memorandum to the Donohue site manager. Revisions and amendments to the SAP should be reviewed by the risk assessor to address potential effects on the risk assessment.

As part of project planning, a site visit will be arranged with the purpose of adequately evaluating the scope of the risk assessment and to orient the personnel designing the risk assessment study to important site features. Human activity patterns involving potentially exposed populations can be either observed or inferred from site conditions. An accurate overview of the site is necessary in the development of the exposure scenarios.

3.0 RISK ASSESSMENT (RI/FS TASK 6)

This task includes efforts to conduct a baseline risk assessment for the Himco Dump site.

3.1 Baseline Risk Assessment

The objective of this evaluation is to characterize and quantify the impact of site contamination on human populations under the assumption of no further remedial action. This assessment is composed of four major analyses:

- Data Evaluation
- Exposure Assessment
- Toxicity Assessment
- Risk Characterization

Each is discussed in the following sections.

3.1.1 Data Evaluation

Once the sampling and monitoring data have been collected and verified as to acceptable accuracy and precision, the data evaluation task begins. This will be done for all data available from the site investigation. The data will be sorted by medium and evaluated based on:

- The analytical methods used;
- The quality of the data with respect to sample quantification limits (SQL), qualifiers and blanks;
- The tentatively identified compounds; and
- A comparison of the samples to background.

The outcome of this evaluation will be (1) the identification of a set of chemicals that are likely to be site-related and, (2) reported concentrations that are of acceptable quality for use in the quantitative risk assessment. Chemicals remaining in the quantitative risk assessment based on this evaluation are "the chemicals of potential concern."

If a large number of chemicals are remaining after this evaluation, the number will be reduced following the procedures outlined in the Human Health Evaluation Manual (HHEM) along with appropriate documentation of the rationale used in the elimination. Concurrence of the EPA Remedial Project Manager will be obtained before any chemicals are eliminated.

3.1.2 Exposure Assessment

The objective of the exposure assessment is to estimate the type and magnitude of exposures to the chemicals of potential concern that are present or migrating from a site. The exposure assessment is a three-step process:

- 1. Characterization of the exposure setting;
- 2. Identification of the exposure pathways; and
- 3. Quantification of exposure.

The exposure setting description involves evaluating the general physical characteristics of the site and the populations on and near the site. Potentially exposed populations are identified, including the presence of any sensitive subpopulations or any potential future populations that may occur with an alternative land use.

All potential exposure pathways are then identified and described based on an evaluation of the sources, releases, types and locations of chemicals at the site, the likely environmental fate of the chemicals, and the location and activities of the potentially exposed populations. The described pathways will include, but will not necessarily be limited to, the pathways described in the conceptual site model. Exposure scenarios are developed, considering the magnitude, frequency and duration of exposure, for each complete pathway. Exposure concentrations will be estimated using monitoring data and/or simple fate and transport models. Intake levels will be calculated for a reasonable maximum exposure case.

Volatilization of gas phases and wind erosion and mechanical disturbances of particulates are potentially important exposure pathways at the Himco Dump. The significance of the air pathway and the extent of the required air pathway analysis should be determined by a site screening study following the EPA guidance (1989a). If the air pathway is determined to be a significant exposure route, an amendment to this plan will be necessary.

3.1.3 Toxicity Assessment

The toxicity assessment will evaluate the potential for the chemicals of potential concern to cause adverse effects in exposed individuals and describe the relationship between the extent of exposure and the increased incidence or severity of adverse health effects in the exposed populations.

Chemical-specific toxicity profiles will be developed according to EPA's guidelines (HHEM, Chpt. 7). Each chemical's noncarcinogenic and carcinogenic effects will be described. A table of toxicity values which will be used to quantify the potential degree of toxicity will be presented. These values will follow the hierarchy of toxicity information and will reflect the most up-to-date information available on each contaminant by utilizing EPA's Integrated Risk Information System (IRIS), Health Effects Assessment Summary Tables (HEAST), and other EPA derived values.

3.1.4 Risk Characterization

The risk characterization summarizes and combines outputs of the exposure and toxicity assessments to characterize the baseline risk assessment, both in quantitative expressions and qualitative statements.

Potential noncarcinogenic effects are characterized by comparing estimated chemical intakes with the acceptable intake (i.e., reference dose). If the resulting ratio (intake level:acceptable level) for noncarcinogens exceeds one (1.0) then there may be a concern for human health. Ratios can be summed for multiple contaminants provided it is across appropriate pathways and a commonality of toxicological effect for each contaminant being summed exists.

Potential carcinogenic effects are characterized by estimating the probability that an individual will develop cancer over a lifetime of exposure by utilizing estimated intakes and chemical-specific dose-response information (i.e., slope factor). The intake levels are multiplied by each carcinogenic chemical's slope factor and summed to obtain a lifetime cancer risk. This approach also assumes that cancer risks for various contaminants are additive. Cancer risk estimates will be compared to EPA's recommended target risk range of 10^{-4} to 10^{-7} .

3.2 Conclusions and Uncertainties

The final section of the risk assessment will draw conclusions regarding whether or not the Site poses unacceptable risks to human populations. The rationale for all conclusions will be presented. A discussion of the uncertainties of risk assessment in general and those specific to the analyses at the Himco Dump site will be presented.

3.3 Ecological Assessment

The current or potential effects of the site and site contaminants on environmental receptors (plants and animals) will be evaluated in a qualitative manner. At this planning stage, it is assumed that the potential for risks to environmental populations is minimal, based on the contaminants identified in the site background materials and the industrial nature of the properties south of the site. If a more thorough and quantitative assessment is required, an amendment to this plan will be necessary.

The qualitative ecological assessment will consist of describing the environmental setting, reviewing and interpreting site data, identifying potentially significant receptor populations, addressing actual or potential adverse ecological effects of the specific site contaminants, and describing the overall significance of ecological threats at the site and surrounding areas. The site visit described in Section 2.0 will be utilized to identify potentially exposed ecological receptors and develop ecological exposure scenarios.

The ecological assessment will be an appendix to the endangerment assessment.

3.4 Endangerment Assessment Document

The baseline risk assessment report and ecological assessment will be included in a draft Endangerment Assessment document and will follow the outline as listed in Table 1. A final Endangerment Assessment report will be prepared and submitted in response to Donohue and EPA review comments.

4.0 REMEDIAL INVESTIGATION REPORTS (RI/FS TASK 8)

The baseline risk assessment findings evaluated in the previous task will also be documented in Chapter 6 of the RI report to be submitted to Donohue. The activities proposed under this task are (1) preparation of the sections of the RI appropriate to risk assessment, (2) participation in a project team meeting with Donohue and EPA to discuss the risk assessment, and (3) revision of the draft report section for incorporation into the final RI.

5.0 REMEDIAL ALTERNATIVES DEVELOPMENT/SCREENING (RI/FS TASK 9)

In this task remedial alternatives are selected to undergo full evaluation. During this screening process, risk must be addressed. Candidate remedial alternatives will be evaluated to determine the extent to which each is protective of human health and the environment. This is accomplished through the development of clean-up or remediation goals, based on the baseline risk assessment for the no-action alternative conducted in Task 3.0, Risk Assessment. The procedure for this includes:

- A re-evaluation of the chemicals of potential concern to address possible releases of new compounds during remediation.
- Review of changes in exposure pathways for each remedial alternative under consideration.
- Review of chemical-specific Applicable, Relevant and Appropriate Requirements (ARARs).
- Determination of clean-up goals based on the baseline risk assessment.
- Qualitative evaluation of alternatives by screening the effectiveness of each alternative in protecting human health and the environment. Both the short-term (construction and implementation period) and long-term (after remedial action is completed) effectiveness are evaluated.

The results of this effort will be documented in a summary report.

TABLE 1 OUTLINE FOR ENDANGERMENT ASSESSMENT

X.X FRONT MATTER

- X.1 Title Page
- X.2 Foreword
- X.3 Table of Contents
- X.4 List of Figures
- X.5 List of Tables
- X.6 List of Acronyms

0.0 EXECUTIVE SUMMARY

1.0 INTRODUCTION

- 1.1 Overview
- 1.2 Site Background
- 1.3 Scope of Endangerment Assessment
- 1.4 Organization of Report

2.0 IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN

- 2.1 General Site-Specific Data Collection Considerations
- 2.2 General Site-Specific Data Evaluation Considerations
- 2.3 Chemicals of Potential Concern in Soils
- 2.4 Chemicals of Potential Concern in Ground-water
- 2.5 Chemicals of Potential Concern in Surface Water/Sediments
- 2.6 Chemicals of Potential Concern in Air
- 2.7 Summary of Chemicals of Potential Concern

3.0 EXPOSURE ASSESSMENT

- 3.1 Characterization of Exposure Setting
- 3.2 Identification of Exposure Pathways
- 3.3 Quantification of Exposure
- 3.4 Identification of Uncertainties
- 3.5 Summary of Exposure Assessment

4.0 TOXICITY ASSESSMENT

- 4.1 Toxicity Information for Noncarcinogenic Effects
- 4.2 Toxicity Information for Carcinogenic Effects
- 4.3 Chemicals for Which No EPA Toxicity Values are Available
- 4.4 Uncertainties Related to Toxicity Information
- 4.5 Summary of Toxicity Information

continued-

Table 1 - continued

5.0 RISK CHARACTERIZATION

- 5.1 Current Land-Use Conditions
- 5.2 Future Land-Use Conditions
- 5.3 Uncertainties
- 5.4 Comparison of Risk Characterization Results to Human Studies
- 5.5 Summary of Discussion and Tabulation of the Risk Characterization

6.0 SUMMARY

- 6.1 Chemicals of Potential Concern
- 6.2 Exposure Assessment
- 6.3 Toxicity Assessment
- 6.4 Risk Characterization

7.0 REFERENCES

APPENDIX 1: Ecological Assessment

6.0 DETAILED ANALYSIS OF ALTERNATIVES (RI/FS TASK 10)

Efforts under this task include the detailed analysis of each alternative that survived the screening process. Again, each alternative being considered must be protective of both human health and the environment. Each alternative is assessed against specific evaluation criteria, which address statutory requirements as well as technical and policy considerations that have proven to be important in selecting remedial action.

A detailed risk assessment will be performed to account for changes from the no-action-alternative assessment. New compounds and new pathways associated with each alternative will be identified and potential exposures and risks evaluated. Of the nine evaluation criteria listed in the RI/FS guidance, the following will be considered utilizing risk information:

- Overall protection of human health and the environment
- Compliance with ARARs
- Long-term effectiveness and permanence
- Short-term effectiveness

The potential for acute exposures to workers and the surrounding community during remediation and the magnitude of residual risk from treated and untreated contaminants will also be evaluated. Potential impacts on human health and the environment should a remedy fail will also be considered.

7.0 FEASIBILITY STUDY REPORTS (RI/FS TASK 11)

The end product of the remedial alternatives evaluation will be a summary of the analyses for incorporation into the draft FS. After review comments are received from EPA, the draft FS sections will be revised for incorporation into the final FS.

8.0 REFERENCES

USEPA. 1989a. U.S. Environmental Protection Agency. Procedures for conducting air pathway analyses for Superfund Applications. Volumes I-IV. Interim Final. Research Triangle Park, North Carolina: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. EPA-450/1-89-001.

USEPA. 1989b. U.S. Environmental Protection Agency. Exposure factors handbook. Washington, DC: U.S. Environmental Protection Agency, Office of Health and Environmental Assessment. EPA/600/8-89/043.

USEPA. 1989c. U.S. Environmental Protection Agency. Health effects assessment summary tables. Washington, DC: U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response and Office of Health and Environmental Assessment. OERR 9.200.6-303-(89-2). Issued quarterly.

USEPA. 1989d. U.S. Environmental Protection Agency. Risk assessment guidance for Superfund. Volume I. Part A. Human health evaluation manual. Interim Final. Washington, DC: U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. 9285.701A, Pre-Publication Copy.

USEPA. 1989e. U.S. Environmental Protection Agency. Risk assessment guidance for Superfund. Volume II. Environmental evaluation manual. Interim Final. Washington, DC: U.S. Environmental Protection Agency, Office of Emergency and Remedial Response and Office of Waste Programs Enforcement. EPA/540/1-89/001.

USEPA. 1988a. U.S. Environmental Protection Agency. Guidance for conducting remedial investigations and feasibility studies under CERCLA. Interim Final. Washington, DC: U.S. Environmental Protection Agency, Office of Emergency and Remedial Response. EPA/540/G-89/004.

USEPA. 1988b. U.S. Environmental Protection Agency. Superfund exposure assessment manual. Washington, DC: U.S. Environmental Protection Agency, Office of Emergency and Remedial Response. EPA/540/1-88/001.

APPENDIX C

Ecological Assessment Plan

Submitted to:

Donohue & Associates, Inc. 111 N. Canal Street, Suite 305 Chicago, IL 60606

Attention: Mr. Roman Gau, Project Manager (1 copy)
Ms. Vanessa Harris, Site Manager (1 copy)

TR-1107-14B

FINAL ECOLOGICAL ASSESSMENT WORK PLAN

The Himco Dump Site Elkhart, Indiana

Prepared Under

Program No. 1522

for

Subcontract No. 68-W8-0093-D

Under

Contract No. 68-W8-0093

for

ICAIR Work Assignment No. 101522

Donohue Work Assignment No. 17-5L4J

Contact: J. A. Duchene

Telephone: (216) 464-3291

June 22, 1990

TABLE OF CONTENTS

			PAC	3 E
1.0	INTRO	DUCTION		1
2.0	TECHN	ICAL APP	ROACH	1
	2.1	Scope o	f the Assessment	1
		2.1.1 2.1.2		2
	2.2	Approac	h to SOW Tasks	4
		2.2.1	Complete Detailed Planning of the Ecological Assessment	4
		2.2.2		5
		2.2.3	Perform a Contaminant Analysis for the	•
				5
		2.2.4	Perform an Exposure Assessment for Ecological	-
				6
		2.2.5	Perform a Toxicity Assessment for Ecological	
			Receptors	6
		2.2.6	Identify State and Federal ARARs and To-Be-	
			Considered (TBC) Requirements for Sensitive and	
			Protected Species Indigenous to the Site Area	6
		2.2.7	Perform Risk and Impact Evaluation	6
		2.2.8	Define Needs and Data Requirements for Additional	
				6
		2.2.9	Prepare and Submit Ecological Assessment Report	6

LIST OF ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
BTAG	Biological Technical Assistance Group
ICAIR	Interdisciplinary Consulting and Information Research
PNRS	Preliminary Natural Resource Survey
SOW	Statement of Work
TBC	To Be Consid ered
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

1.0 INTRODUCTION

This final ecological assessment work plan presents the detailed approach for implementing an ecological assessment for the Himco Superfund Site in Elkhart, Indiana.

The detailed Statement of Work (SOW) for the ecological assessment is presented in the Revised Work Assignment Plan (TR-1107-3-10A) dated January 22, 1990.

The proposed approach and planned activities are consistent with U.S. Environmental Protection Agency (USEPA) guidance for performing ecological assessments at Superfund sites contained in the document "Interim Final Risk Assessment Guidance for Superfund--Environmental Evaluation Manual," EPA/540/1-89/001.

This final work plan addresses comments on the revised ecological assessment work plan (TR-1107-14A) and the ecological assessment work plan (TR-1107-14) provided in the following documents:

- Ostrodka (USEPA) to Lance (USEPA) memorandum dated 03/28/90
- Hudak (USFWS) to Lance letter dated 03/23/90
- Hudak (USFWS) to Studniarz letter dated 01/29/90

2.0 TECHNICAL APPROACH

2.1 Scope of the Assessment

An ecological assessment is needed to characterize the biological resources of the Himco Site and adjacent habitats and provide sufficient information for the USEPA Region V Superfund Biological Technical Assistance Group (BTAG) to determine the need for tissue sampling and toxicity tests of soils, sediments and surface water.

The scope of the planned assessment is limited to characterizing the environmental setting, including an ecological inventory and identifying potential impacts associated with release of hazardous substances from the site. This initial assessment will be conducted after Donohue and Associates have completed their wetlands inventory, analysis of surface water drainage patterns, field sampling and laboratory analyses and provided results to Life Systems, Inc.

The scope of the planned assessment does not include the following:

- Bioassays, toxicity testing, biomarker studies or tissue sampling
- An evaluation of ecological impacts of remedial alternatives
- Establishment of clean-up goals and remedial action objectives for ecological resources

The study area is defined as the site and specific off-site areas determined by Donohue and Associates to receive potentially contaminated surface water runoff from the site. Based on current background information, areas of greatest potential concern to be included in the assessment are as follows:

- The area south of the gravel pit, west of the Nappanee Street Extension
- The three open water and wetland areas on site, including the gravel pit area in the northeast corner of the site and the two surface water bodies in the southwest corner of the site.
- The wetlands and streams northwest of the site, and the Osborn-Manning ditch, which drains to the St. Joseph River
- The ditch/retention basin located along the Eastern boundary of the fill area and the aqueduct on the southern end

Emphasis in the field survey will be placed on those areas shown or suspected to be contaminated. Donohue's analysis of surface drainage patterns and field sampling results will be used to identify and characterize areas which have not been sampled by Donohue (i.e., the Osborn-Manning ditch, the ditch/retention basin, the aqueduct or other wetlands within a one-mile radius of the site) but are suspected of being contaminated currently or in the future. These areas will be included in the inventory of potentially-impacted ecological resources. It is anticipated that the evaluation of potential ecological impacts in areas of suspected contamination will be more qualitative than that performed for areas where actual contamination is detected.

This assessment will focus on potentially exposed ecological resources in these areas, which are summarized in the next section.

2.1.1 Potentially Exposed Ecological Resources

Protected ecological resources potentially exposed to site contaminants include the following:

- The Indiana bat (Myotis sodalis)
- Migratory waterfowl
- Jurisdictional wetlands
- Fish populations in streams draining the site which are protected by Indiana state water quality standards
- Trout populations established in streams draining the site as part of Indiana's put-and-take fishery program
- · Recreationally important fish populations in the St. Joseph River

The Indiana bat is an endangered species which may forage over the wooded areas, wetlands and areas of riparian vegetation in the vicinity of the site. It may also breed in wooded areas nearby.

Migrating waterfowl may visit wetlands on the site and in areas nearby which are drained by the site. Species include the mallard (Anas platyrhynchos), the black duck (Anas rubripes) and the northern pintail (Anas acuta). Other waterfowl species of regional and national significance may also visit the site.

Donohue and Associates will characterize jurisdictional wetlands on site and immediately northwest of the site.

Populations of indigenous fish populations may exist in streams draining the site which are protected by Indiana water quality standards (Indiana Administrative Code, Title 327 - Water Pollution Control Board, Articles 1 and 2 - Water Quality Standards, as amended September 24, 1987). These standards represent potential applicable or relevant and appropriate requirements (ARARs) for the ecological assessment.

Streams draining the site may be used in Indiana's trout stocking program to improve local fishing. The use of these streams for this program needs to be identified.

Preliminary assessment endpoints for these ecological resources are identified in the next section.

2.1.2 Preliminary Assessment Endpoints

In general, assessment endpoints for the ecological resources listed above involve adverse impacts resulting from direct (ingestion or contact with contaminated materials) or indirect (food chain mechanisms) exposures (Attachment 1). Candidate endpoints include the following:

- Sublethal effects in exposed organisms
- Toxic effects in exposed organisms leading to reduction in population size
- Undesirable shifts in community structure
- Bioaccumulation and biomagnification of toxic chemicals in the food chains

Due to the limited scope of the assessment, only qualitative evaluations are planned based on field observations and results of previous biological studies in areas contaminated by site releases. Sublethal and other toxic effects on protected species will be inferred by direct observations of stressed vegetation, fish kills, etc. in areas of known contamination. Exceedances of Indiana numerical water quality standards for protection of aquatic life will

be interpreted as an index of potential adverse effects on aquatic species. A similar analysis will use measured levels of other contaminants in surface waters and toxicological data from the literature for appropriate fish or invertebrate species.

The presence of contaminants in wetlands and streams which are known to bioconcentrate and bioaccumulate in organisms will be used to evaluate potential food chain effects.

Undesirable shifts in community structure (wetland vegetation and fish populations) will be evaluated based on a comparison of field observations in the vicinity of the site (similar contaminated and uncontaminated areas) and descriptions of these communities in previous studies of the area. Records of fish kills or stressed vegetation in areas of contamination are examples of observations that can be used to infer undesirable changes in ecological communities. Follow up detailed field surveys and toxicity tests would be needed to confirm any apparent impacts.

The specific tasks to be performed are presented under Task 8.0 of the Revised Work Assignment Plan for the Himco Dump Site (TR-1107-3-10A) and are described below. The efforts to be performed under the major tasks are summarized in the next section.

Chemical sampling and characterization of wetlands required for performing the ecological assessment are described in the Work Plan prepared by Donohue and Associates.

2.2 Approach to SOW Tasks

The following summarizes the specific activities to be performed in the nine subtasks under Task 8.0, Ecological Assessment, of the Revised Work Assignment Plan.

2.2.1 Complete Detailed Planning of the Ecological Assessment

Activities under this task will involve expanded coordination with state and Federal agencies to obtain additional existing information on surrounding areas. At a minimum, the following individuals in Indiana state offices will be contacted:

- Mr. John Winter
 Department of Environment Management
 Water Quality Branch
 Indiana Department of Environmental Management
- Mr. William James
 Division of Fish and Wildlife
 Indiana Department of Natural Resources

- 3. Mr. Hank Huffman Indiana Natural Heritage Program Division of Nature Preserves Indiana Department of Natural Resources
- 4. Mr. Gary Doxtater
 Indiana Department of Natural Resources
- 5. Mr. Reggie Baker Superfund Site Management Section Indiana Department of Environmental Management

These individuals will be contacted to obtain technical reports and data from previous biological studies conducted in the vicinity of the site and to discuss site-specific ARARs. A request will be submitted for a printout from the Indiana Natural Heritage Program data base for information on state and Federal protected species which may occur in the vicinity of the site.

Ms. Robin Nims and Mr. David C. Hudak of the USFWS Bloomington Field Office will be contacted for any specific reports or data on biological resources in the vicinity of the site.

Information provided by these individuals will be used to design the field inventory, identify ARARs and interpret potential impacts of site releases on ecological resources. Specific assessment endpoints will be clarified following a review of material obtained from the sources listed above.

2.2.2 Develop an Ecological Inventory for the Site

A preliminary ecological inventory by Life Systems, Inc. will be performed by a qualified biological scientist based on information obtained from state and Federal agencies and results of the characterization and classification of wetlands, surface drainage patterns and environmental media contamination by Donohue. The field survey will be performed to further characterize protected ecological resources and identify specific locations where ecological resources are likely to be exposed to contaminant releases in those areas identified in Section 2.1 above. Any areas of visible impact of contaminant releases on vegetation will be noted and evaluated qualitatively.

The field survey will be a qualitative evaluation of the plant and animal communities present in actual or potentially contaminated areas on site and within a one-mile radius. Dominant terrestrial plant species will be identified in areas not already characterized by Donohue's wetland inventory. No field collection of plant or animal specimens is planned.

2.2.3 Perform a Contaminant Analysis for the Ecological Assessment

Results of chemical sampling in areas where protected ecological resources may be exposed will be analyzed to identify chemicals of potential toxicological concern for these resources.

2.2.4 Perform an Exposure Assessment for Ecological Receptors

An exposure assessment will be performed to characterize specific populations potentially exposed to releases of toxic chemicals from the site. The exposure assessment will characterize qualitatively both direct and indirect exposures. Potential exposure points (locations) will be identified where further toxicity testing may be needed.

2.2.5 Perform a Toxicity Assessment for Ecological Receptors

Toxicity summaries will be prepared for contaminants occurring at locations where ecological resources may be exposed. Bioassay results will be summarized for species thought to be exposed at this site. Information of food chain transfer of contaminants will also be provided.

2.2.6 Identify State and Federal ARARs and To-Be-Considered (TBC)
Requirements for Sensitive and Protected Species Indigenous to the
Site Area

Information obtained from state and Federal agencies during detailed planning will be used to identify site-specific ARARs protective of ecological resources. Monitoring data will be compared with numerical standards protective of aquatic species as part of the evaluation of impacts described in the next section.

2.2.7 Perform Risk and Impact Evaluation

Information from the biological inventory, wetlands survey, contaminant assessment and toxicity assessment will be integrated to evaluate potential risk and impacts to protected ecological resources.

2.2.8 Define Needs and Data Requirements for Additional Ecological Assessment Activities

Recommendations and supporting rationale for further toxicity testing will be developed.

2.2.9 Prepare and Submit Ecological Assessment Report

An Ecological Assessment Report summarizing results and data from task activities will be prepared and submitted. The Report will be prepared according to general specification presented in Section 6.0 of Interim Final Risk Assessment Guidance for Superfund — Environmental Evaluation Manual (EPA/540/1-89/001).

APPENDIX D

Proposed Project Schedule

		ACTIVITY		ORIG	TOTL	EARLY	EORLY	Idba		1990			<u></u>		1441		
CLIAILA ID		ACTIVITY DESCRIPTION		DUR	FLT	START	FINESH		JA [ES 194 4			KI MA S	EC AN RED	** **		416 E	Kr
01		RECEIVE WAF			25	25SEP89	25SEP84	<u>}</u> · · · ·							• •		•
01		MEETING WITH R		1	25	265EP89	265EP89	<u>}</u>								. ,	•
01	5	REVIEW PROJECT		5_	25	275EP89	300,189	0									•
01W		PROPERTY SEARC		2	71	27SEP89	28SEP89	1	·. ·. · . •.	•. •. •.			·. ·.		٠. ٠.	·. ·.	٠.
01		SCOPING MEETIN		1	25	400189	400189] ≀									
01	4	SITE CONCEPTUA		1	49	500189	500189] 」									
01	8	ACQUIRE EXISTI	NG [NFORMATION	1	49	500189	500189] ≀									
01	7	DOD MEETING		1	49	600189	600 189]), , , ,									
01	19	PRELIMINARY ID	OF RA'S, ARAR'S	5	72	600189	900189	.0									
01G		ENDANGERMENT A	SSESSMENT PLAN	10	63	900189	2000189],0, ,									
01	15	PREPARE SITE V	ISIT - HASP	5	0	9N0V89	1000489	1) .									
01	16	SITE VISIT		1	23	1300789	13N0V89										
02	20	SCOPING W/RPM		1	0	19DEC89	19DEC89	1	· · · · · · · · · · · · · · · · · · ·				٠. ٠.	·· ·· ·-	•• •-	·. ·.	٠.
01A		PRE-QAPP MEETI	NG	1	0	3JAN90	3JAN90	1 ' ')	• • •	• •	• • •	• •	• •	• •	• •	•
01B		QAPP		10	11	4JAN90	17JAN90	1 ' '	П			• • •			• •		•
010		FSP		7	2	4JAN90	12JAN90	╣	П.					• • •	• •	• •	
110		DRAFTING		15		4JAN90	24JAN90	1	<u>~</u>	• • • • •		• • • • •	٠. ٠.	•• •- •-	•- •-	٠. •.	•-
01D		HSP		3	- 2	15JAN90	17JAN90	† ' '				• • •					•
OIE			PROCUREMENTS/DELIVERABLES SUBCONT	2		18JAN90	19JAN90	† · ·	. •			• • •		• • •	• •		•
01F		CPP/PMO REVIEW		5	7	22JAN90	23JAN90	╂ ' '	· '			• • •		• • •	• •		•
OIH		WP		 7	<u>_</u>		30JAN90		· . '				•• ••		•• ••	•- •-	•-
01J		TECH/EDTL QC		<u></u>		31JAN90	1FEB90	-∤· · ·	. ५				• •		• •	• •	•
01X		REVISE PROJECT	DLAN	11	2		16FEB90	-} · ·	. ¦,			• • •					•
OIK			DRAFT PROJECT PLANS	<u></u>	- 2	19FEB90	20FEB90	-∤ ・・	. ५			• •					•
			ROJECT PLANS TO EPA		0	23FEB90	23FEB90	4	'		· · · · ·				••		•-
01L 01N			RUJECT PEHNS TO EPH			26FEB90	23FEB90 23MAR90	-}									
01M		EPA REVIEW SUBMIT ADV FUN	DC DEDUCCT	20	41 28	8MAR90	8MAR90	-l	💾 .								
011			VANCED FUNDING REQUEST	5_	58	9MAR90	15MAR90	.	!!		· •• •• •	·- ·- ·-					
50		FRAC TANK SPEC		5	91	16MAR90	22MAR90	4	<u>.</u> .								
23			TIES/UTILITIES	2	84	16MAR90	19MAR90	4	<u>.</u> .								
53			ENT & BOTTLE REQUEST	5	86	16MAR90	22MAR90	4									
30			IELD SURVEY SPECS/SOW	6_		16MAR90	23MAR90	4	, . , . , . <u></u> .		. ,. ,- ,		,- ,-			,- ,-	
20		FRAC TANK BID		5_	91	23MAR90	29MAR90	4									
5:	36	PROCURE EQUIPM		5	- 86	23MAR90	29MAR90	1									
010		EPA COMMENT ME		1_	41	26MAR90	26MAR90										•
01P		REVISE PROJECT		5	41	27MAR90	2APR90										٠.
21	10	FRAC TANK SOLI	CIT BIDS	1_	91	30MAR90	30MAR90										
21	14	FRAC TANK RECE	IVE BIDS	15	91	2APR90	20APR90	Ţ	. , , с	ı,					• •	٠.	•
30	03	AERIAL PHOTO F	IELD SURVEY BID PACKAGE	50	28	2APR90	27APR90]· · ·		」			٠.		• •	• •	•
21	18	FRAC TANK EPA	APPROVAL	10	91	23APR90	4MAY90]		o , '			• •		• •		•
30	25	AERIAL PHOTO F	IELD SURVEY SOLICIT BIDS	10	28	30APR90	11MAY90	1		<u> </u>	• • •		•			• •	·
		tivity Bar/Early Dates	Dr	NOHUF	8 Ac	SOCIATES	, INC - 2	20026			Sheet	of 5		2464	NAME I STATED		
	⊒ Gri	itical Activity										•	Deser	-	161	Unstant	•
		apress for		MH			DUMP RI/FS	3									_
			Benjart Stant - 25/3100		PR0	IJECT SCH	EDULE				Nata Bai	. 25 9EP8 4	<u> </u>				
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	ACTIVITY		ORIG	TOTL	E VDI A	EARLY		•	Τ			195				т		194			
CTIVITY ID	DESCRIPTION		URIG DUR	FLT	EARLY START	EARLY FIN(SH			348 F	EB 1968	-			329 (K.f	187 EC	JAK FEE	1000 4			44 97	Tec.
307	AERIAL PHOTO F	IELD SURVEY RECEIVE BIDS	5	58	14MAY90	18MAY90					[1			•					•	
249	SET UP FACILIT	IES/STAKE GRIDS	5	84	15MAY90	16MAY90	7				1	۱									
309	AERIAL PHOTO F	IELD SURVEY EPA APPROVAL	10	58	OPYAMIS	4JUN90]					ο.									
Q	SUBMIT REVISED	PROJECT PLANS	1	0	31MAY90	31MAY90]					1.									
PA .	SECOND REVISION	N - PROJECT PLANS	50	0	1JUN90	0PNULBS	1			• . •			٠	• • •	• •				•		
311	AERIAL PHOTO F	IELD SURVEY - AWARD SUBCONTRACT	1	28	5JUN90	5JUN90	7														
313	SITE SURVEY -	AERIAL & GRID & PROPERTY SURVEY	5	66	6JUN90	12JUN90	7					.0 .									
401	FIXED RATE AER	IAL FLIGHT	5	134	6JUN90	12JUN90	7					.0.									
403	MAPPING & TOPO		20	134	13JUN90	11,01,90	1:::		`• ´	- ` -	· · ·		j 🗀	• • •	• •		· ·		`•		
2B	SUBMIT FINAL F	ROJECT PLANS	1	0	29JUN90	29JUN90	1			·		. 1		•	•		•	•	•	·	
R		NAL PROJECT PLANS	10	0	230190	16JUL90	1	•	•	•			3		•		• •	• •	•	•	•
S	EPA APPROVE CF		20	35	2,101,90	30JUL90	1 '	•	• •	•	• •	· r		• •	•	• •		• •	•	•	•
204	DRILLING SPECS		5	0		23JUL90	1 · ·	٠.	٠	· · ·	٠- ٠-		•	• • • •	• '•	'- '-	٠. ٠.	·• ·-	٠. '	· ··	٠.
238	CLP LAB ASSIGN		5	38	17,10,190	23JUL90	╣ .	٠		•			п.	• • •	•	• •			•	•	•
٧	SELECT COMMIT		1	37	17JUL90	17,101,90	1 '	•		•			1	• • •	•				•	•	٠
239	HISTORICAL PRE		<u>·</u>	37	18,000,90	24,101,90	1 '	•		•			n .		•					•	•
240	CLP SAMPLERS (41	18JUL90	18,000.00	1	٠.	٠- ٠	٠ ٠ -	٠. ٠.	•••			- •-	•• •-	•• ••		•-	• ••	•
242	FIELD TEAM BRI		· · · · · · · · ·	39		18,01,90	-∤' '	•		•			;· ·	• • •	•				•	•	•
246	FIELD FORMS PE		<u>'</u>	41	18,01,90	18,01,90	† ·	•	• •	•			<u>'</u>	• •	•	• •		• •	•	•	•
247	ARRANGE PPG 8		'	41	18,101.90	18JUL90	┪ '	٠		•			¦· ·		•				•	•	
248		RATE, LOAD EQUIPMENT	5	40	18JUL90	1930640	∤ ···	٠.	• • •	· · -	•- •-	•••	\\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \			•- •-	• • • •	•• •-	••		
Y 240	ADMINISTRATIVE		50	293		265EP90	-∤ •	٠		•			'	<u>`</u> -,' '	•	• •			•	•	
<u>'</u> Z	PRP SUPPORT	. NECOND	30	273		28AUG90	-} ·	•	• •	•				٠, ,	•	• •		• •	•	•	
244	PRE-FIELD MEMO	nc .	5	39		2010190	╂	•		•			<u>ب</u>	• •	•				•	•	
208	DRILLING BID F		<u> </u>	0		30JUL90	-∤			· · ·			٠			••	••		•-	- ,-	
212	DRILLING SOLIC		<u>J</u>	0		31JUL90	ተ •	•		٠			•		•	•				•	
222		FY SUBCONTRACTOR		35	31JUL90	31JUL90		•		٠			-		•						
215	PRE-BID SITE			0	1AUG90	1AUG90	- 1-	•		•			٠.		•					•	
	DRILLING RECE		15	0	2AUG90	22AUG90	-∤						٠ 🚣	· · · ·		,-			,	- ,-	
216							-														
227		CCESS & SECURITY	10	20	2AUG90	15AUG90	-														
558	UTILITIES/CLE			29	2AUG90	290690	-J														
230		ING/WELL LOCATIONS	<u></u>	50	16AUG90	16AUG90	-∤			- , -			يان. ٠	<u>.</u>	- ,-	,-				- ,-	
550	DRILLING EPA		15	0		135EP90	վ														•
224		IFY SUBCONTRACTOR	<u>}</u>	0		145EP90	-							<u>.</u>							
250	MOBILIZE	100050	5	0		21SEP90	┨							'-		. ,					
256		CORES - INSTALL WELLS	55	0		2300190	↓		,		, - , -		٠,٠,	. 🖵	- ,-	,- ,-	,· .·	,- ,-			
263	WELL INVENTORY		3	36		265EP90	4							. I							
266	INSTALL STAFF		3		24SEP90		4			·				<u> </u>							
568		S INVESTIGATION	10		245EP90	500,190	1	•						_							
290	FIELD AUDIT		5		245EP90		. ∵.		• •	٠.				. ľ							
315	CAP SOIL SAMPL	[NG	4	8	245EP90	275EP90	<u> </u>		• •	•	•	• •	•	<u> </u>	<u> </u>	• •				<u> </u>	_
	Activity BorrEarly Dates		DONOHUE	8 A	SOCIATES	i, INC -	92005						Shee	t 2 of	5			2026 THRO	(TAL		•
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ACTIVITY ID	ACTIVITY DESCRIPTION		ORIG DUR	TOTL FLT	EARLY START	EARLY FIN(SH	1999	AN FEB 1908	400 Hart	1990 AA 1890	ALS CEPT	acr lune lu	(paul sz	Tues Tee	194	1) 100 100	#16 (4 P M
327		SEDIMENT SAMPLING	5		24SEP90	255EP90		111	1		<u> </u>					<u></u>	
337	USGS WELL SAMP	LING	5	7	24SEP90	285EP90]				0						
347	PRIVATE WELL/G	AS SAMPLING	3	9	245EP90	265EP90]						. ,				
357	WETLANDS SURVE	Y/SAMPLING	2	114	24SEP90	255EP90]				1 .						
361	GEOPHYSICS EM	8 MAGNETIC	12	143	245EP90	900190]			• • •		j	, ,			• • •	
371	FENCE		2	50	24SEP90	255EP90]				1.						
03A	CLP COORDINATI		1	18	24SEP90	245EP90]				. , I,						
251		IP SURFACE SAMPLES	10		255EP90	900190]				c	J				٠, ٠	
254		SHIP LGN SOIL SAMPLES	3	25		27SEP90]				ં ,ે		, ,				
329		GE & SHIP SW/SEDIMENT SAMPLES	1	10		265EP90	<u>]</u>				, , i ,		. ,				
359		O - WETLANDS SURVEY/SAMPLING	22	114	265EP90	275EP90	<u>.</u>				. , l						
278	FIELD MEMO - 9		5	85		300190					0	l	·. ·.	٠. ٠.	٠. ٠.		
580	FIELD MEMO - N		5	100		300,190					0	١					
331	FIELD MEMO - S		2	68		28SEP90					, , <u>!</u>						
333		ATA VALIDATION - SW/SEDIMENT	60	10		21DEC90					, , Ç		י, כ				
349		GE & SHIP PRIVATE WELL SAMPLES	1	9		275EP90					۱ ا		٠. ٠.				
317		GE & SHIP SOIL SAMPLES	1	8	28SEP90	28SEP90	J				!						
351		RIVATE WELL SAMPLES	2	67		100190					. , <u>1</u>						
353_		ATA VALIDATION - PRIVATE WELL SAMP	60	9		24DEC90	4				[⊃				
319	FIELD MEMO - S		2	66	10CT90	200190					!	<u> </u>					
321		ATA EVALUATION - SOIL SAMPLES	60	8	100190	26DEC90	4				!		⊃				
339		GE & SHIP - USGS WELL SAMPLING		7	100190	100790	↓				!						
341		SGS WELL SAMPLING	2	65	200190	300190	4				!						
343		ATA VALIDATION -USGS WELL	60	7	001305	27DEC90	4				!		J., ,.				
279	WASTE MASS GAS		5	68	900,100	1200190	-{					<u> </u>					
031 253	FIELD TECH MEN	ATA VALIDATION - SOIL	40 5	22 57	900190	50EC90 150CT90	. , ,					<u></u>					
353	DEMOBILIZE	U - SUIL		304	1000140	1000190	-{- · · ·					Ÿ · ·					
363		& INTERPRETATION - EM-31 SURVEY		143	1000190	1000190	-{· · · · · ·					· · · ·	,· ,-	,- , -	, - , -		- ,- ,-
365		10 - EM-31 SURVEY		143		1200190	-										
257		SHIP GEOTECH SAMPLES	2	19		2500190	╣			•		` <u>.</u>					
259	DEVELOP WELLS	SHIF OCUTECH SHIP CES	7	- ' '		180790	4										
284	SURVEY WELLS	GALIGES	2	64	2400190	2500190	1			• • •	,		••••	••		••••	٠,٠,٠
033		ATA VALIDATION - GEOTECH	40	19		24DEC90	-}					<u>, </u>	٠ .				
261	PERFORM SLUG 1		7	52	200740	120000	↑ · ·			•		<u>n</u> .	-				
262		SURFACE WATER LEVELS	1	58	200740	200400	† · ·					Ĩ.					
275	DEMOBILIZE		<u>-</u>	0	200740	2N0V90	1	•- •- •-	• • • • •	• • •			·. ·.			· · ·	
046	EVALUATE SLUG	TEST DATA	<u>·</u> 5		1300090	1900090	1					'n.		• •			
276		ORINGS/INST/SLUG/LEVELS	5		13NDV90	1900090						_					
264		PACKAGE & SHIP GW SAMPLES	4		1600090	21N0V90	† ⋅ ⋅										
035		ATA VALIDATION - GW	40		26N0V90	22JAN91	†			• •			≐ ∵			• • •	· · ·
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	Progress for		WA 1	7-5L4	IJ HIMCO	DUMP RIVE	j										
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Data Bate: 2592P84 Plot Bate: 10JUL90

Project Start - 25/9EP89 Project Finish: 200EC91

Prisevera Systems, Inc. 199-1990

ACTIVITY 18	OCTIVITY	ORIG	TOTL	EARLY	EGRLY	1490 1490 1491
<u>ACTIVITY ID</u> 277	DESCRIPTION FIELD MEMO - GW SAMPLING	DUR 5	<u>FLT</u> 35	START 26NOV90	F IN (SH 30ND V 90	
041	EVALUATE DATA SOILS	10	55	6DEC90	19DEC90	- [
042	TECH MEMO - 50[L	<u></u> 5	55	200EC90	270EC90	
335	REPORTATECH MEMO - SWASEDIMENT	10	10		8JAN91	
044	EVALUATE DATA - GEOTECH	5	19	26DEC90	2JAN91	
355	REPORT/TECH MEMO - PRIVATE WELL SAMPLES	10	9	260EC90	9JAN91	
325	REPORT/TECH MEMO - SOIL SAMPLES	10	8	27DEC90	10JAN91	
345	REPORT/TECH MEMO - USGS WELL SAMPLING	10	 7	280EC90	PPARLI	
083	REM ALTS DEV & SCREENING	30	19	3JAN91	13FEB91	<u></u> ' . ' . ' . ' . ' . ' . ' . ' . ' . ' .
043	EVALUATE DATA	10	0	23JAN91	5FEB91	
049	TECH MEMO'S - GW/GEOL	10	15	6FEB91	19FEB91	
055	ENDANGERMENT ASSESSMENT	20	0	6FEB91	5MAR91	
501	EVALUATE BED ROCK WELL	5	50	6FEB91	12FEB91	
)55A	ECOLOGICAL ASSESSMENT	20	0	6FEB91	5MAR91	
093	DETAILED ANALYSIS OF ALT'S	60	15	20FEB91	14MAY91	
071	DRAFT RI REPORT	20	45	6MAR91	2APR91	
405	ADDRESS AIR PATHWAY ANALYSES	5	0	6MAR91	12MAR91	
407	A FISH SAMPLING	5	0	6MAR91	12MAR91	
409	SCOPE PHASE II R/I	10	0	13MAR91	26MAR91	
411	EPA APPROVE PHASE II	10	0	27MAR91	9APR91	
072	QC DRAFT RI REPORT	2	168	3APR91	4APR91	
072	SUBMIT DRAFT RE REPORT		168	5APR91	5APR91	- • · · · · · · · · · · · · · · · · · · ·
073	EPA COMMENT MEETING	5	168	BAPR91	12APR91	-
413	PHASE II FIELD OPERATION	20	0	10APR91	7MAY91	- ᆌ · · · · · · · · · · · · · · · · · · ·
075	REVISE RI REPORT	5	168	15APR91	19APR91	
076	FINAL RI REPORT	5	168	22APR91	23APR91	
077	SUBMIT FINAL RI REPORT	1	168	24APR91	24APR91	-
415	PHASE II R/I REPORT	20	0	8MAY91	5JUN91	-
801	DEV REMEDIAL ACTION OBJECTIVES	<u>5</u>	15	15MAY91	16MAY91	entre de la companya
803	DEV GENERAL RESPONSE ACTIONS	3	15	17MAY91	21MAY91	-
805	IDENT VOLUMES OF AREAS OF MEDIA	<u>~</u> 5	15	22MAY91	29MAY91	
417	EPA APPROVE PHASE II R/I REPORT	10	- 13	6)UN91	19,0091	
807	IDENT & SCREEN REMEDIAL TECH & PROC OPTIONS	6	-	20JUN91	27JUN91	en e
809	EVALUATION OF PROCESS OPTIONS	5		28JUN91	5JUL91	
811	ASSEMBLY OF ALTERNATIVES	2	- 0	8JUL91	9,01,91	
813	ALTERNATIVES DEFINITION	2	0	1030141	113064	
815	SCREENING EVALUATION OF ALTERNATIVES	<u>~</u>	0	12,101,91	1730191	🕇 contractor contractor contractor i 🕯 cont
817	SELECT ALTERNATIVES FOR DETAILED ANALYSIS	<u> </u>			22JUL91	-
819	EPA & IDEM APPROVAL OF ALTERNATIVES	<u></u> ე		18,01,91		–
821	POST SCREENING TASKS (ARARS)	<u> </u>		23JUL91 26JUL91	25JUL91 1AUG91	-
901	ALTERNATIVE DEFINITION	2	0		5AUG91	<mark>-</mark> recenterace and accessor at a transfer a
	Activity Berlarly Dates				i, INC - i	20026 Sheet 4 of 5 266 IMEET SAES
	Critical Activity				-	Date Britains Durant Sun
•	happen for	WH 1			DUMP RI/F	
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risevera System	, Inc. 1991-1990 Project Finish: 200EC91					Plot Date: 10.0L.40

~***********	ACTIVITY DESCRIPTION	ORIG Dur	TOTL FLT	EARLY START	EARLY	190 (90)
903	INDIVIDUAL ANALYSIS OF ALTERNATIVES	14	0	6AUG91	<u>FINISH</u> 23AUG91	S 8CT 1987 18CC JAM 17CS 1990 1999 1997 JAM JAL 1935 1SEP 18CT 1887 18CC JAM 17CS 1999 1997 JAM JAL 1935 1SEP 1
905	COMPARATIVE EVALUATION OF ACCEPTABLE ALTERNATIVE	11		26AUG91	105EP91	
907	COST EFFECTIVENESS ANALYSIS	7	0	115EP91	195EP91	
909	DECISION ANALYSIS (SENSITIVITY ANALYSIS)	4	0		25SEP91	
1001	DRAFT F.S. REPORT	7	0		400191	``````````````````````````````````
01 1	SUBMIT DRAFT F.S REPORT TO EPA	3	0	700191	90CT91	
01 2	AGENCY REVIEW OF DRAFT F S REPORT	21	0		7N0V91	
1002	PUBLIC MEETING	5	0	PNDV91	1100791	
1003	FINAL F.S. REPORT	4	0	1200041	1500791	
03 1	SUBMIT FINAL F.S. REPORT TO EPA	3	0		2000491	
3 2	AGENCY REVIEW OF FINAL F S REPORT	21	0	1PVON1S	20DEC91	7,
	Activity Barrianty Dates	NOHUF	8 AC	SOCIATES	5, [NC -	20026 Sneet 5 of 5 also IMMER SUID
	Critical Activity				DUMP RI/F	Direct Discount Discount
·	Programa Bur	nn I	, DE	מסוינוו כי	DOTE KIZZ	

PROJECT SCHEDULE

Data Bate: 25/EP84 Plot Bate: 10,001,40

Project Start - 259EP89 Project Finish: 200EC91

Prisovera Systems, Inc. 196-199

APPENDIX E

Background Information



ecology and environment, inc.

111 WEST JACKSON BLVD., CHICAGO, ILLINOIS 60604, TEL. 312-663-9415.
International Specialists in the Environment

NARRATIVE SUMMARY
HIMCO DUMP
ELKHART, INDIANA

The Himco Dump site covers approximately 40 acres of former marsh land. The site is located at County Road 10 and the Napanee Extension in the Town of Elkhart, located in Elkhart County, Indiana. The site operated between 1960 and 1976 under the ownership of Mr. Charles Himes. A marshy area was excavated and general refuse, medical and pharmaceutical wastes were landfilled in the resulting hole. There is also a possibility that industrial waste was buried in the excavation.

The total amount of hazardous waste landfilled at the site is unknown. According to laboratory analysis of samples taken by Ecology and Environment FIT members during the site inspection of July 30, 1984, groundwater is contaminated with cobalt, selenium, beryllium, cadmium, copper, manganese, and other inorganic metals. The Rocky Mountain Analytical Laboratory performed the above analysis which corroborated earlier residential well sample analysis which showed high manganese levels. The site is located above a continuous portion of the local outwash aquifer system that is the sole source of drinking water for the community. A conservative estimate of 20,000 people may be affected by drinking water contaminated by the site.

In 1974, Mr. Himes was advised by the State Health Commissioner to drill deep wells for six local residences that were shown to have contaminated shallow wells.

In 1975, Mr. Himes signed a consent agreement (adopted by the Stream Pollution Control Board) that resulted in the closing of the landfill in September 1976. Much of the landfill was covered by sand. Several leachate streams were visible during the site inspection of July 30, 1984 by the E & E FIT.

In 1980, the USGS conducted a hydrogeologic study of the area and this helped influence the installation by U.S. EPA of two interceptor wells to divert contaminated groundwater away from the North Main Street Well Field located approximately 1 1/2 miles south east of the site. The interceptor wells have NPDES permits and discharge into nearby Christiana Creek.

22Z:1T

DETECTED METALS - 1984 Himco Dump Elkhart, Indiana

Units: ug/l (pph)

									off:	site			Sed	liment
	Field	Upgradie	nt Wells				Dup		Down G	radient	Surfa	ce Water	Units:	mg/kg (ppm)
<u>Analytes</u>	<u>Blank</u>	D/19'	D/174'	E/17'	E/1.74'	M/24'	M24'	P/24'	<u>1/35'</u>	1/172'	UG	DG	<u>UG</u>	_DG_
Aluminum	-	12,500	-	350,000	-	296	269	175	1,890	-	-	-	1,640	424
Arsenic	-	26	-	200	-	-	-	26	-	-	-	-	1.8	2.0
Barium	-	121	-	803	165	172	175	97	414	66	-	-	14	-
Beryllium	-	•	-	11	-	·	-	-	-	-	-	-	-	-
Cadmium	-	•	-	10	-	-	-	-	-	-	-	-	-	-
Chromium	-	370	-	461	-	16	12	-	-	-	-	-	3.9	1.3
Cobalt	-	-	-	132	-		-	-	-	-	-	-	2.7	
Copper	-	73	-	555	-	-	-	•	-	-	•	•	3.9	•
Iron	-	67,400	1,230	146,000	1,580	12,300	14,800	11,400	5,520	507	246	210	4,380	1,550
Lead	-	73	-	401	-	7.7	9.0	6.7	-	-		-	5.8	1.6
Manganese	-	1,630	158	2,150	41	331	320	182	133	24	24	12	43	103
Mercury	-	0.21	-	1.4	•	-	-	-	-	-	-	•	-	-
Nickel	-	103	-	422	•	-	-	-	-	-	-	-	4.4	-
Selenium		-	2.0	14	-	•	-	4.7	-	•	-	-	-	-
Tin	-	-	-	-	32	-		-	-	55	-	-	1.1	1.2
Vanadium	-	-		326	-	-	-	-	-	-	-	-	-	-
Zinc	11	164	38	1,630	44	224	309	58	18	55	65	-	19	5

^{- -} Not detected at or above contract required detection limit.

UG - Upgradient

DG - Downgradient

X/YY' - Well/sampling depth in feet.

ARCS/P/HIMCO/AB8

DETECTED ORGANICS - 1984 Himco Dump Elkhart, Indiana

Units: ug/l (ppb)

										site	- •		Sedin	
_	Fleld		ent Wells	5/174	5 (3.7)		Dup	D 1011		radient		Water		g/kg (ppb)
Compound	<u>Blank</u>	D/19'	D/174'	E/17'	E/174'	M/24'	M/24'	P/24'	1/35.	1/172'	UG	DG	UG	DG
Volatiles														
Acetone	32	39	39		164	60	100	230					492 C	66 C
Benzene	5 K	5 K	5		5 K	5 K	5 K	4	5 K		5 K	5 K		10 K
2-Butanone					106		79							
Chloroethane								13						
Chlorofluoromethane					43 J	57 J	37 J	18 J						
Dichlorodifluorometh	ane				61 J	79 J	56 J	14 J						
1,1-Dichloroethane								15						
Trans 1,2-														
Dichloroethene					8	9	7							
Diethylether								44 J					45 J	78 J
1,4-Dioxane								9 J						
Ethylbenzene									5 K					
2 - Hexanone									5 K					
Methylene Chloride				5 K	5 K	5			5 K		15 C		319 C	249 C
Toluene	5 K			5 K	5 K	3	5 K	5 K	5 K	5 K			10 K	10 K
Trichloroethane					5 K		5 K	5 K						
Carbon Disulfide									1					
C														

Semi-Volatiles

1,2,4-Trichlorobenzene	10 K
1,4-Dichlorobenzene	7 K

K - Compound detected above instrument detection limit but below contract required detection limit.

J - Compound identified by computer library search, concentration estimated.

C - Associated lab blank contained detectable level, value reported has had blank level subtracted from it.

UG - Upgradient.

DG - Downgradient.

X/YY' - Well/sampling depth in feet.

DETECTED ORGANICS - 1984 Himco Dump Elkhart, Indiana (Continued)

Units: ug/l (ppb)

									Of E	site			Sedi	ment
	Field		ent Wells				Dup			cadient	Surfac	e Water	Units; u	g/kg (ppb)
Compound	<u>Blank</u>	D/19'	D/174'	E/17'	E/174'	M/24'	M/24'	P/24'	1/35'	1/1/2'	<u>UG</u>	DG	UG	DG
Naphthalene	10 K													
Di-N-Butylphthalate	10 K	10 K	10 K	10 K	1.5	10 K		10 K	10 K	10 K	10 K	10 K		
Acenapthene					25 K									
2,4-Dinitrotoluene					20 K									
N-Nitrosodinpropylam	ni ne				9									
Pyrene					13									
Phenol						62	76							
4-Methylphenol						197	235							
Bis(2-cthylhexyl)														
phthalate						1.0 K	266 C	20						
Diethylphthalate	10 K			10 K					10 K				150 K	
Caprolactam						224 J	145 J							
Sulfur						39 J	41 J						1180 J	
Dioctylester-														
hexanonedioic acid	l						1190 J							
<u>Unknowns</u>														
Volatile fraction							5 J							
Semi-Volatile fracti	on												1080 J	1390 J

PCB/Pesticides

None detected

K - Compound detected above instrument detection limit but below contract required detection limit.

J - Compound identified by computer library search, concentration estimated.

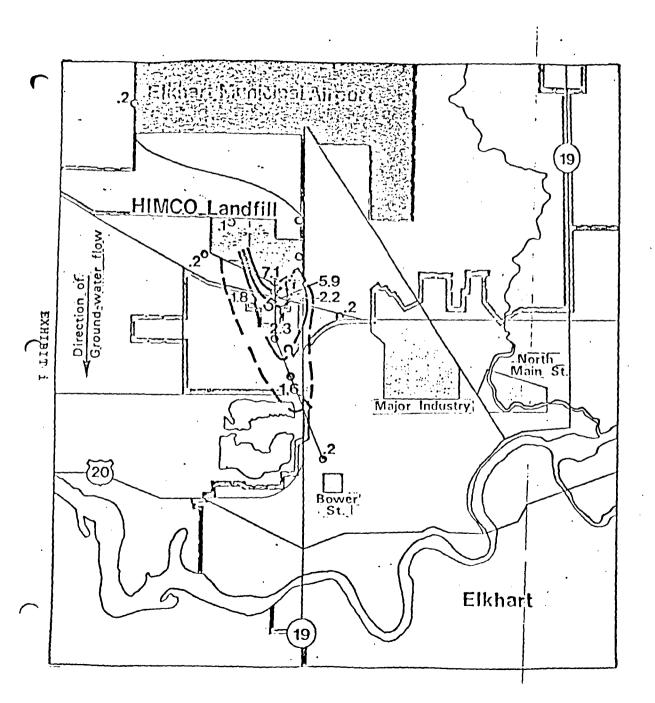
C - Associated lab blank contained detectable level, value reported has had blank level subtracted from it.

UG - Upgradient

DG - Downgradient

ARCS/P/HTMCO/AB7

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Areal distribution of Bromide concentrations in the Shallow Aquifer, September 1979.

Line of equal Bromide Concentration mg/L

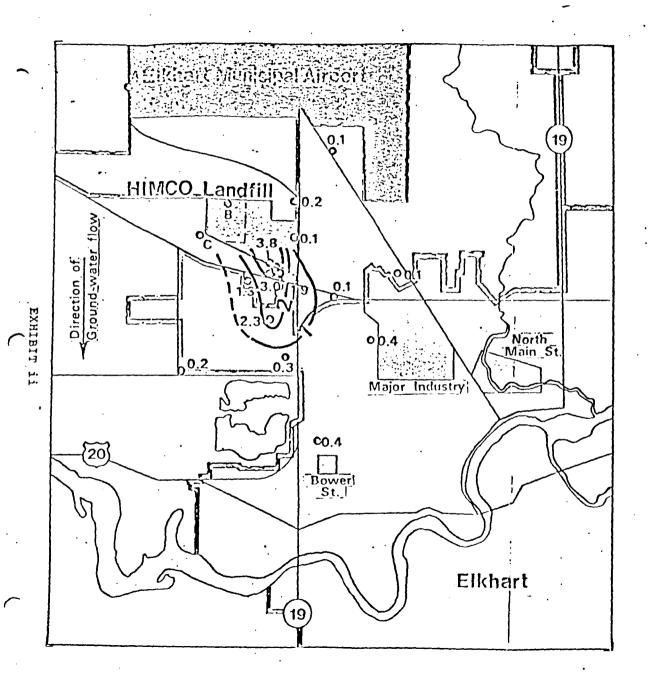
Dashed where approximate

0.2

Well site/Bromide concentration mg/L



- = line of section



Areal distribution of Bromide concentrations in the Shallow Aquifer, November-December 1980.

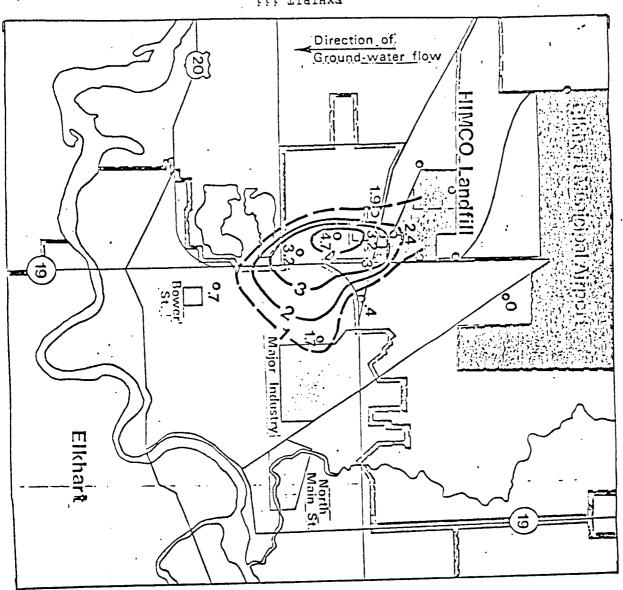
Line of equal Bromide concentration mg/L

Dashed where approximate

_.2

Well site/Bromide concentration mg/L

Well field



Bromide concentrations the Shallow Aquirer, July-August 1982. Areal distribution of 3

Line of equal Bromide Dashed where approximate concentration mg/

Well sice/Bromide concentration mg/L

Well field...

HIMCO_Landfill Direction of: Ground-water flow North Main St. Major Industry 0.1 ${20}$ Bowerl St. Elkhart

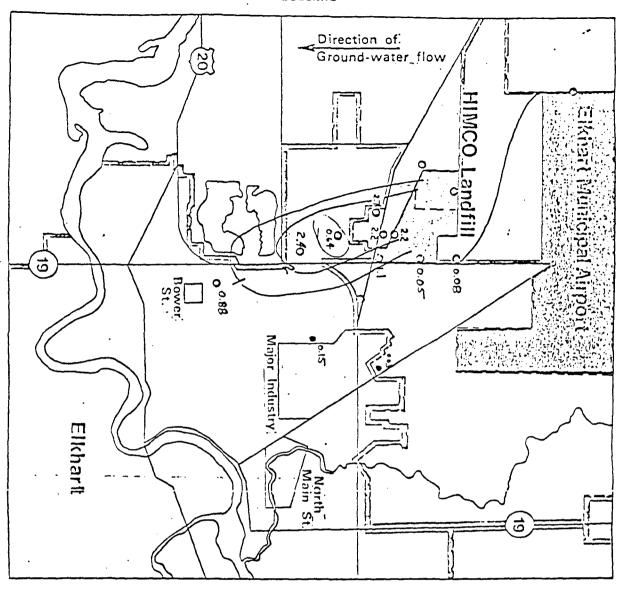
Areal distribution of Bromide concentrations in the Shallow Aquifer,
July 1983.

Line of equal Bromide concentration mg/L Dashed where approximate

0.2

Well site/Bromide concentration mg/L

Well field



Bromide concentrations in the Shallow Aquifer, Areal distribution of July 1984

)

 Dashed where approximate concentration, mg/L Line of equal Bromide

Well site/Bromide concentration mg/L

Well field

ż

X Elkhart Municipal Airport HIMCO_Landfill Ground-water North Main St. 0.10 Major Industry 0 0.74 Bower' Elkhart

Areal_distribution of Bromide concentrations in the Shallow Aquifer,

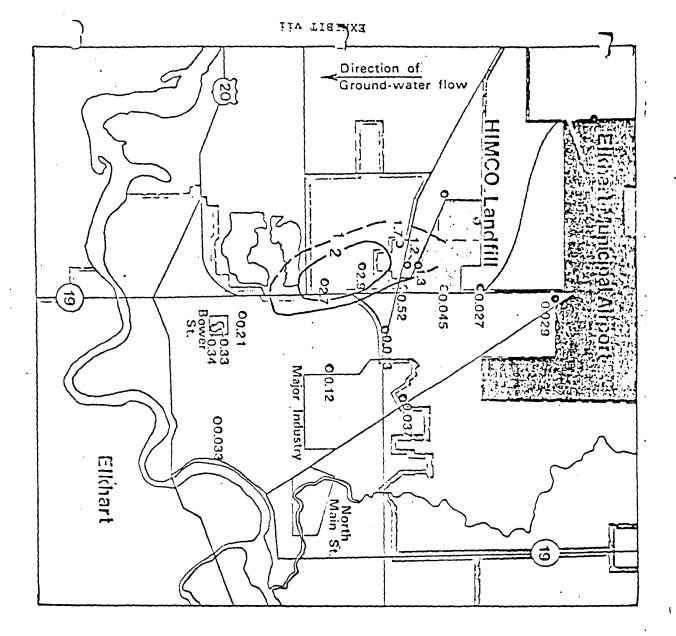
August 1985

Line of equal Bromide concentration mg/L Dashed where approximate

 $o^{.2}$

Well site/Bromide concentration mg/L

| Well field

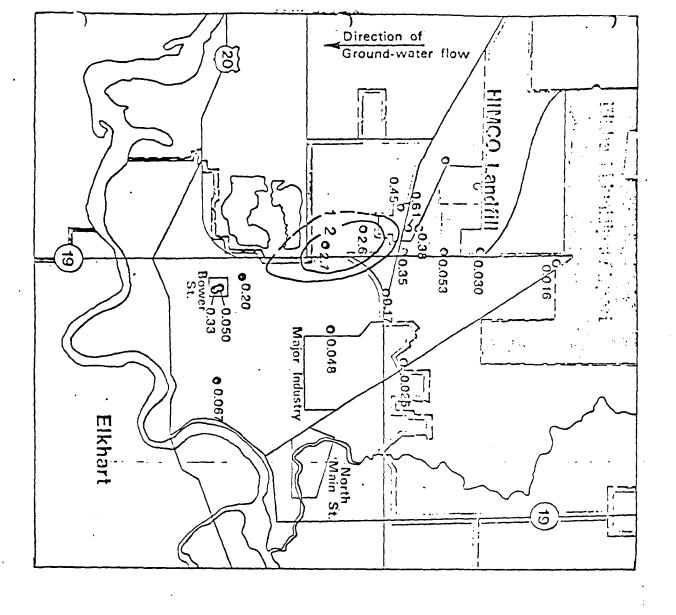


Bromide concentrations in the Shallow Aquifer, Areal distribution of September 1986

Line of equal Bromide concentration mg/L Dashed where approximate

Well site/Bromide concentration rag/L . 0.2

Well field



Areal distribution of Bromide concentrations in the Shallow Aquifer, September 1987

Line of equal Bromicle concentration mg/L
Dashed where approximate

Well site/Bromide concentration mg/L

0.2

Well field

77 - 376

1-1

DIVISION OF WATER DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA STATE OFFICE BUILDING INDIANAPOLIS, INDIANA 46204 Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION (Fill in completely - Refer to instruction sheet)
County in which well was drilled
Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc. Twp. 381 16.41 Sec. 36
Nout 1/2 'i. U. of Cappannoo Ct. on (c. 17. 10 & alout 1/2 'i. H. of pr V. Well
NAME OF WELL OWNER and/or BUILDING CONTRACTOR
Well Owner U. S. (cological Survey Address 1819 ". "eridian, Indianapolis, Ind.
Building Contractor Address
Name of Well Drilling Contractor: Crtman Prilling, Tree.
Address 717 S. Malfalfa Road, Mokorc, Indiana
Name of Drilling Equipment Operator: Rick G., Lowell C., Dan F., Frank C.
WELL INFORMATION
Depth of well: 496 Date well was completed: Cc1. 6, 1977
Diameter of casing or drive pipe: 5" FIC Total Length: 490
Diameter of liner (if used); Total Length:
Diameter of Screen: 42" Length: 475 ft. to bottom of screen
Type of Well: Drilled Gravel Pack Driven Orber Other
Use of Well: For Home Test For Industry For Public Supply Stock
to the state of th
Static water level in completed well (Distance from ground to water level)
Bailer Test: Hours Tested Rate g.p.m. Drawdown ft. (Drawdown is the difference between static level and water
Pumping Test: Hours Tested 12 Rate 60 g.p.m. Drawdown ft. level at end of test)
Signature Octmon Dullaria La
Signature October ?7, 1977

10/6/77 FOR ADMINISTRATIVE USE ONLY (Well driller does not fill out) N= 4/1/4/1 SEC SIG Subdivision Name 762 Ground Elevation Topo Map_ Depth to bedrock 489 Field Located _Ft N of SL. _Ft E of WL. Courthouse Location By _____ Date _ Bedrock elevation SFIS of NL. Location accepted w/o verification by ____ Aquifer elevation _____ Lot Number_ 687 967 333 318 375 747 ٩ C 275 318 375 475 637 င္က From WATER WELL LOG FORMATIONS (Color, type of material, hardness, etc.) etone end rravel (201) broken rlath วินนส med. pravil w/sone sand בפחל ע/כר med, mrevel & broken rravel 500 160 , L9h brown siltstone tt: coar rrore 1 fine gravel to red shale Ωį. ç fire to HE. fire fine 1.CC • 1 Inc :xcc. ion. ĸ

U. S. GEOLOGICAL SURVEY WRD - INDIANA COMPOSITE LITHOLOGIC LOG

(DATA FROM DRILLER'S AND GAMMA LOGS)

PROJECT: ELKHART	COUNTY:	Elkhart	•••		
WELL # B1	INTERPRETATION BY: A. Martin				
DATE: 4/30/79					
FORMATION	···· · · · · · · · · · · · · · · · · ·	From	To		
Sand & Sievel.	1325	0:	1/32		
Clos	:	132	135		
Sind & Gravel		135	292		
Sittle Land & Grave	13545	292	357		
Such & Signal .		307	427		
Small 1	:	427	172		
		1992	755		
	• • • • • • • • • • • • • • • • • • • •	. .i.			

C+1

DIVISION OF WATER DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA STATE OFFICE BUILDING INDIANAPOLIS, INDIANA 46204

Telephone 633-5267 Area Code 317

WELL RECORD WATER

WELL LOCATION (Fi	ll in completely - Refer	r to instruction sheet)		lawalama
County in which well was drilled_	Flkhart.	Civil Townsh	nip	leveland
Driving directions to the well locat	. Include County R	oad Names, Numbers, S Twp. 38N	Subdivision Name, R. 4F Scc.	lot number, distinctive 36
About 1/2 Mi. W. of Nappane	e St. on Co. Rd. 10	about 1/8 Mi. N.	of F.o N.	Well
NAME OF WELL OWNER and/or				
Well Owner U. S. (60)	ofical Survey	Address 1819 N. Me	ridian, India	mapolis, Ind.
Building Contractor				
Name of Well Drilling Contractor:		lling, Inc.		
Address		falfa Road, Kokomo,	·	
Name of Drilling Equipment Opera	tor: Rick	O., Frank G., Lowe	11 (., Dan E.	·
WELL INFORMATION				
	5	well was completed: _	Oct. 4	, 1977
Depth of well:				
Diameter of liner (if used):	51 101	Total Length: _		S! WW
Diameter of Screen:	Length:	······································	Slot Size:	of screen
Type of Well: Drilled 🗓	Gravel Pack	Driven 🗌	Other	
Use of Well: For Home	Test For Industry	For F	Public Supply] Stock
Method of Drilling: Cable To	ols Rotary 🔀	Rev. Rotary		ket Rig
Static water level in completed wel	l (Distance from ground	to water level)	6.7	feet
Bailer Test: Hours Tested	Rate	_g.p.m. Drawdown_		Drawdown is the difference
Pumping Test: Hours Tested	/ir Rate 35	_g.p.m. Drawdown_	ft.	etween static level and water evel at end of test)
	Siş	gnature <u> </u>	- Lighting	Janes of
	Da	Oct	oter 27, 1977	/

FOR ADMINISTRATIVE USE ONLY (Well driller does not fill out)

															not f													1
1:	COUNT	Y_4	F- //	<u>(/)</u>	21	<i>†</i>			TWP.	<u></u>	71	RGE.				· '	_ ¼ <u>/</u>	¼		SE	c	<u>, , , , , , , , , , , , , , , , , , , </u>		S	ubdivi	sion N	ame	
	Горо М	ap	<u> Dec</u>	000	la_								_			_Ft W	of EL.	Gro	und El	levatio	n	, T.,						
	Field L	ocated	l	Ву	U.S	J. G.	<u> </u>	Date	100				_			Ft N	of SL.											
																	of WL.			levatio								
																	of NL.											
			,,,,,,														OI 14E.	75 Yu		CVACIO					vanio			
2	55	135		143	147	671	151	153	154	156	159	160	161	180	195	210	228	230	235	255	305	33	355					
	0	55		135	143	14.7	149	151	153	154	156	159	160	161	180	195	210	228	230	235	255	305	343					
1 1 1 1				-	7																•		,					
						,	\	\	1		`							1										
EODMATIONS (Color two of motorial bandrass atc.)		fine to med, sand & fine fravel - very sandy	95 - 100 streaks of gray clay	sand brown clay	med. sand w/some gravel	sandy brown clay	med. sand w/sore gravel	1 1	sand & gravel	brown-fray clay	sand & gravel	brownish gray clay	sand & Fravel	brownish rray clay	medium sand & gravel	fine to med, sand & gravel (sandy)	sand & gravel (brownish gray clay	fine to med, sand & cone gravel	ned. sond & gravel w/some troken shale	fine send	fine to med. sand & fine gravel	fine s and	bottom of screen 340 ft.	10 hrs.	200 PrI	8 jts. 160 PCI (70+) 1 jt. 160 PCI plain	c at 116

U. S. GEOLOGICAL SURVEY

WRD - INDIANA

COMPOSITE LITHOLOGIC LOG

PROJECT: EL KHART	COUNTY:	EL KHART	· · · · · · · · · · · · · · · · · · ·
WELL # (-)	INTERPRE	TATION BY:	A Mister
DATE: 4/25/29			•••
FORMATION	,,,,	From	То
Sand & Griel.	1475		147
Sandy Clay	: (147	149
Sand & Grayel	25	149	151
Sondy Clay	<u>:</u>	151	153
Sind & Grave	15	153	15-4
Clay '	:	154	156
Sand & Gravel	3 }	156	159
Clay		159	160
Sand & Grave 1	1 {	160	161
<u> C10 ja</u>		161	170
Sand & Grove	48 3	180	228
Clay		208	330°
Sand & Grapel	125 8	230	355

77 - 376

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DIVISION OF WATER DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA STATE OFFICE BUILDING INDIANAPOLIS, INDIANA 46204

Telephone 633-5267 Area Code 317

WELL LOCA	ATION (Fill i	n completely - I	Refer to in	struction sheet)		
County in whic	h well was drilled	Elkhart		Civil Towns	ship	leveland	
•	ons to the well location	Include Count	y Road N	ames, Numbers,	Subdivision	Name, lot nu Sec. 36	imber, distinctive
About 1/2	2 Mi. N. of Co. Ro	. 10 on Nappa	nee St.	on W. sd. of	rd.		
	LL OWNER and/or BU			ss <u>1819 N. M</u>	eridian,	Indianapol	is, Ind.
Building	g Contractor		Addre	ss			
Name of Well D	orilling Contractor:	Ortman Dr	illing,	Inc.	-		
Addense		717 S. Ma	lfalfa R	oad, Kokomo,	Indiana		
Name of Drillin	g Equipment Operator	:R	ick O.,	Lowell C., F	rank G., 1	Dan E.	
WELL INFO Depth of well:				vas completed:			
	er (if used): reen:			_		.018 Sf	WW of screen
Type of Well:	Drilled X	Gravel Pack [Driven 🗌		Other	
Use of Well:	For Home Tes	For Indu	istry 🔲	For	Public Supp	oly 🗌	Stock 🔲
Method of Drill	ing: Cable Tools	Rotary [X Rev	. Rotary 🔲	Jet 🗌	Bucket Ri	g 🔲
Static water leve	el in completed well (I	Distance from gro	und to wa	ter level)		14	feet
Bailer Test:	Hours Tested	Rate	g.p.n	n. Drawdown.	ft.	(Drawdow	n is the difference
Pumping Test:	Hours Tested 1						tatic level and water
			Signatur	e <u>Calm</u>	ر ()	Al min	Marine .
			Date	Oc	tober 27,	1977	. /

WATER WELL	roc				٠ 		-
FORMATIONS (Color, type of material, hardness, etc.)	From	To	٤ ٤) <u>T</u> i			6
fine brown sand & gravel	0	18	Cation	Field Located	Торо Мар	COUNTY) V
fine to med. gravel	18	49	Location accepted w/o ve	cated	P	1	, ,
gritty sandy gray clay	49	52	yed w				
fine to med. sand & gravel w/streaks of gray	1 5 2	168	Location accepted w/o verification by	. By	المريح	3	`
med. sand & gravel w/sand	. 168	174	ficatio		<u> </u>	. 3	
blue shale	174	185	n by	, .~	γ	ļ	
				- 			
(used rolyphos on this well)			• c	Date _		1	
4 hrs.				101		TWP.	
				1		30	_
NOTE: 2 jts. 200 PSI (20+)					3	RGE	FOR ALMINISTRATIVE USE ONLY (Well driller does not fill out)
6 jts. 160 PSI (20+)				· .	<u></u>	·	ADMINISTRATIVE USE ON (Well driller does not fill out)
11' 160 PSI					6		ISTRA
							(TIVE
			FIS	, <u> </u>	F. A	1	USE (
·			FIS of NL	Ft N of SL	Ft W of EL	×	S YILY
			. ,	:	· ·	1	
			Aquit	Dept	Grout	- X	
			Bedrock elevation Aquifer elevation	t to be	nd Ele		
			Bedrock elevation Aquifer elevation _	Depth to bedrock_	Ground Elevation_	_SEC.	
				\ \-			
				0 / 1	769	<i>i.</i>	
				·]		-	
			Lot Number			Subd	
			nber			livisior	
						Subdivision Name	•
						77	
	L	L	L			 	

U. S. GEOLOGICAL SURVEY WRD - INDIANA COMPOSITE LITHOLOGIC LOG

PROJECT: ELKHART COUNTY:	FLKHART	
WELL # D-2 INTERPRE	TATION BY:	7 Marin
DATE: 4/30/79 ·	·········	
FORMATION	From	То
Sand & Gravel - 468	0	46
Clay	46	50
Sand & Grave (124 }	50	174
Shale	124	185
	:	
′		
		
· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	
		
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77 - 376

DIVISION OF WATER DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA STATE OFFICE BUILDING

E. Test Hot

INDIANAPOLIS, INDIANA 46204 Telephone 633-5267 Area Code 317

WELL LOCATION (Fill in completely - Refer to in	nstruction sheet)
County in which well was drilled Elkhart	Civil TownshipCleveland
Driving directions to the well location: Include County Road, N	lames, Numbers, Subdivision Name, lot number, distinctive
landilarks, etc.	Twp. 38N R. 4E Sec. 36
About 800 W. of Nappanee St. on N. side of Co.	na. 10 - South Fole
NAME OF WELL OWNER and/or BUILDING CONTRACTOR	
Well Owner U. S. Ceological Survey Address	ess 1819 N. Feridian, Indianapolis, Ind.
Building Contractor Addre	ess
Name of Well Drilling Contractor: Ortman Drillin	g, Inc.
Address 717 S. Kalfalf	a Road, Kokomo, Indiana
Name of Drilling Equipment Operator: Rick C	
WELL INFORMATION	
Depth of well: 315 Date well v	was completed: Oct. 10, 1977
Diameter of casing or drive pipe:none	
Diameter of liner (if used):	Total Length:
Diameter of Screen: Length:	
Type of Well: Drilled X Gravel Pack	Driven Other
Use of Well: For Home Test For Industry	For Public Supply Stock
Method of Drilling: Cable Tools Rotary Rec	v. Rotary 🗌 Jet 🔲 Bucket Rig 🔲
Static water level in completed well (Distance from ground to wa	iter level)feet
Bailer Test: Hours Tested Rate g.p.r	m. Drawdown ft. (Drawdown is the difference between static level and water
Pumping Test: Hours Tested Rate g.p.r	
Signatur	Cotober 27, 1977
Date	October 27, 1977

A

FORMATIONS (Color, type of material, hardness, etc.)	From	To	۲	င	<u> </u>	7	cc	11.
brown dirty sand	0	6	Location accepted w/o verification by	Courthouse Location	Field Located	Торо Мар	COUNTY	,
gray fine to med. sand w/some gravel	6	30	п ассе	Jase L	ocated	\$	1	/est
gray med. sand & gravel	30	82	pted w	ocatio		25) 	Jest 110
gray clay	82	84	/jo vei	n By	Ву	cer	03	
ine to med. sand & gravel -	84	88	ificati		0	2/16	1	
gray clay	88	89	on by		(A)	- 1	'	
ine to med.brown sand w/some gravel	89	165)		
andy gray clay	165	167		Date	Date			
ray fine to med. sand & gravel	167	176			101		TWP,	
ritty gray clay	176	195),		1.	
ine to med. sand & gravel	195	197			1.		1	2
ray clay	197	199			1		_RGE	(Well driller does not fill out)
and & gravel	199	202		1			1/2	(Well driller does not fill out)
ray clay	202	210	,			10	17.11	er doc
ray fine to med. sand & gravel	210	221						S not i
ray clay	221	233	FtS	FLE	Fix	F(₩	1	ill out
ine to med. sand & gravel w/streaks of clay	233	253	Ft S of NL	Fi E of WL.	Ft N of SL.	Ft W of EL	*	
ranite boulder	253	255	•	:	٠	,		
ray clay	255	260	Aqui	Bedr	Dept	Cron	*	,
soft blue-gray clay	260	303	Aquifer elevation	Bedrock elevation	Depth to bedrock	Ground Elevation		
olue shale	303	315	vation	evalio	edroci	evation	SEC	
				Ī,	Į.	١		
, hrs.				5	0	16'		:
No well set					\sigma:	1		
			Lot				Ş	
			Lot Numbe				inipqi	
			C1				Subdivision Name	
							iame	

77 - 376

F - #5

DIVISION OF WATER DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA

STATE OFFICE BUILDING INDIANAPOLIS, INDIANA 46204 Telephone 633-5267 Area Code 317

WEL	L LOCAT	rion (1		-	Refer to ins	truction sh	ieet)			
Count	ty in which	well was drilled		lkhart		Civil To	wnship	Csolo		
	•	s to the well loc	ation: In	clude Count dmarks, etc	y Road Nar	nes, Numbe	ers, Subdivisio • 51' Sec •	n Name,	lot number,	distinctive
<u>On</u>	N. sd. c	f Tr. Rt. 19	where Ro	. sterts	to curve	to S. E	. Well	·		
 NAMI		OWNER and/o				3010 W	N-424	7-31		Y-2
	Well Own	er U.S. Ced	logical	Eurvey	Address	1819 %	. Meridian	, incla	napolis,	Ind.
	Building (Contractor			Address	·				
Name	of Well Dri	lling Contractor	·:	rtman Dri	llling, In	ic.				
۵ddra	.	6	•	717 S. Mai	Lfalfa Ros	d, Kokom	o, Indiana			
Name	of Drilling	Equipment Ope	rator:	Ric	k 0., Fra	ınk G., L	owell (.,	Dan E.		
		MATION 225		r	Date well wa	s complete	0ct	. 11, 1	.977	
		g or drive pipe:								
Diame	eter of liner	(if used):				Total Leng	gth:			
		en:2#								
		Drilled X								
Use of	f Well:	For Home	Test	For Indu	stry 🔲	1	For Public S	apply [] Sto	ock 🗌
Metho	od of Drillin	g: Cable T	ools 🗌	Rotary [Rev.	Rotary [] Jet 🗌	Buc	ket Rig 🔲	
Static	water level	in completed w	ell (Distan	ce from gro	und to wate	r level)	 	15.4		feet
Bailer	Test:	Hours Tested_	Ra	te	g.p.m.	Drawdo	wn		Drawdown is t	
Pump	ing Test:	Hours Tested_	Air Ra	30	g.p.m.	Drawdo	wn	ft. le	etween static le- vel at end of tes	
					Signature		in Du		fre-	•j
					Date	C	ctober 26	1977		

FOR ADMINISTRATIVE USE ONLY (Well driller does not fill out) COUNTY TWP. 38/N RGE. SE SW W SEC 3/
Topo Map //// By Date 7/1/2 Cround Elevation 260

Field Located By Date 7/1/2 Cround Elevation 260 Subdivision Name Depth to bedrock 220 Courthouse Location By ______ Date _____ Ft E of WL. Location accepted w/o verification by _____Ft S of NL. Aquifer elevation _____ Lot Number __ 8 137 156 220 225 From 0 156 220 WATER WELL LOG FORMATIONS (Color, type of material, hardness, etc.) gravel fine to ned. sand w/same gravel (20t) gravel sand कु 160 frey cley w/streaks med. sand & mavel Eray fine dirty sand fine brown sand fine dirty send med, to coarse soft fray clay ر. دن دن blue shale 5 Fray clay clay gray clay ţ hrs. NOTE:

U. S. GEOLOGICAL SURVEY

WRD - INDIANA

COMPOSITE LITHOLOGIC LOG

PROJECT: FLKHART	COUNTY:	ELKHART	
WELL # F-5	INTERPRE	TATION RY:	A Mac -
DATE: 4//2 73			
FORMATION	···· · · · · · · · · · · · · · · · · ·	FROM	То
Sand & Grade	375	0	-37
C10%	•	3/	79
Dile Sand	143	79:	93
(13/2	:	93:	100
Time Sind	28 8	100	128
Sindy Clay	:	122	135
Sand & Grove /	23 8	136	157
Clay		158	766
Servi	1 }	166	16;
Clay		167	185
Sond & Grape	13 }	182	175
(lag w/ Stronks or in	1 75%	195	2/2
(Tuz.	. ()	2/2	: <u>7</u> :20
Shall		220	22



DIVISION OF WATER DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA STATE OFFICE BUILDING INDIANAPOLIS, INDIANA 46204

Telephone 633-5267 Area Code 317

WELL LOCATION (Fill in completely - Refer to instruction sheet)
County in which well was drilled Fikhart Civil Township Osolo
Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive
N. of Eristel St. on Idwardsburg Ave. 1 Flock, th. W. about 150° on N. sd. N. Well
NAME OF WELL OWNER and/or BUILDING CONTRACTOR U. S. Geological Survey 1819 N. Feridian, Indianapolis, Ind.
Well Owner U. S. Geological Survey Address 1819 N. Meridian, Indianapolis, Ind.
Building Contractor Address
Name of Well Drilling Contractor: Ortman Drilling, Inc.
Address 717 S. Malfalfa Road, Kokomo, Indiana
Name of Drilling Equipment Operator: Rick O., Frank G., Lowell C., Dan E.
WELL INFORMATION Depth of well: Date well was completed: 0ct. 17, 1977 Diameter of casing or drive pipe: Total Length: 160
Diameter of liner (if used): Total Length:
Diameter of Screen: Length: 5 long Slot Size:018 fs www
Type of Well: Drilled X Gravel Pack Driven Driven Other
Use of Well: For Home Test For Industry For Public Supply Stock
Method of Drilling: Cable Tools Rotary Rev. Rotary I Jet Bucket Rig
Static water level in completed well (Distance from ground to water level)
Bailer Test: Hours Tested Rate g.p.m. Drawdown ft. (Drawdown is the difference
Pumping Test: Hours Tested Air Rate
Signature <u>Culture</u> form of Date

1917/19 FOR ADMINISTRATIVE USE ONLY (Well driller does not fill out) COUNTY TWP: TWP: RGE E NOW NE SEC 31 Subdivision Name FI W of EL Topo Map_ By _____ Date ____ Depth to bedrock 2/6 ____Ft N of SL. Field Located Courthouse Location By _____ Date ____ _____Ft E of WL. Location accepted w/o verification by Aquifer elevation _____ Lot Number ____ 89 302 216 216 0 68 180 186 36 202 65 WATER WELL LOG FORMATIONS (Color, type of material, hardness, etc.) fine to ned. sand w/sore gravel (204) (204) gravel 160 PCI 쫎 soft pinkish brown clay 28 160 e۷ 90ವರ jts. sand & gravel fine to med. blue shale ray clay gray clay gray clay rray clay brownish 4 hrs. NOTE:

U. S. GEOLOGICAL SURVEY WRD - INDIANA COMPOSITE LITHOLOGIC LOG

(Data from Driller's and Gamma Logs)

PROJECT: ELKHART COUNTY: FI KHART 61000 l O(20. 216 224

I-1

DIVISION OF WATER DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA STATE OFFICE BUILDING INDIANAPOLIS, INDIANA 46204

Telephone 633-5267 Area Code 317

WELL RECORD WATER

WELL LOCATION (Fill in completely - Refer to instruction sheet) Flkhart Cleveland
County in which well was drilled County Pood Name Number Subdivision Name Include County Pood Name Subdivision Name Include Subdivision Name Inclu
Driving directions to the well location: Twp. 38!! R. 4E Sec. 36
1 Plock N. of Mishawaka St. on Happanee St., th. W. 1/2 Flock on S. sd. W. Well
•
NAME OF WELL OWNER and/or BUILDING CONTRACTOR
Well Owner U. S. Geological Survey Address 1819 N. "eridian, Indianapolis, Ind.
Building Contractor Address
Name of Well Drilling Contractor: 717 S. Malfalfa Road, Kokomo, Indiana
717 S. Malfalfa Road, Kokomo, Indiana Address
Name of Drilling Equipment Operator:
WELL INFORMATION
Depth of well: Date well was completed:
Diameter of casing or drive pipe: Total Length:
Diameter of liner (if used): Total Length:
Diameter of Screen: Length: 5;
Type of Well: Drilled Gravel Pack Driven Other
Ose of well. Tol frome Tol mustry Tol rubite supply Stock
Method of Drilling: Cable Tools Rotary Rev. Rotary I Jet Bucket Rig
Static water level in completed well (Distance from ground to water level)
Bailer Test: Hours Tested Rate g.p.m. Drawdown ft. (Drawdown is the difference
Pumping Test: Hours Tested Air Rate 100 Between static level and water level at end of test) between static level and water level at end of test)
Signature Ortober 26, 1977
October 26, 1977

WAIER WEL	1		Y
FORMATIONS (Color, type of material, hardness, etc.)	From	To	ר ט א ז ט
sand	0	6	COUNTY Topo Map Field Located By Courthouse Location By Location accepted w/o verification by
red sandy clay	6	8	Ap yeated was L
sand & fine gravel	8	26	ocatio
sandy gray clay	26	28	By By //o ver
send & med. to coarse gravel	- 28	37	rificati
sandy gray clay	37	124	
fine to red. gravel	124	174	
fritty brown clay	174	184	Date Date
fine gravel	184	193	TWP:
blue shale	193	195	
			S 🗲
4 hrs.			FIT OF NI
			ADMINISTRATIVE USE ON (Well drifter does not fill out) GE FI W FI E o FI S o
NOTE: 3 Jts. 200 PSI (20+)			TRAIN er does
5 jts. 160 PSI (20+)			IVE US
3' 160 PSI			FI E OF IS C
·			SE ONLY Ill out) FI W of EL FI N of SL FI E of WL FI S of NL
			Groun Depth Bedro
			nd Ele 1 to be
			SEC 365 Evation 752 Addrock 193 Addrock 193 Addrock 59 Valion 559
			752
			Subdl
			Subdivision Name
			er
			Vame
		<u></u>	<u> </u>

U. S. GEOLOGICAL SURVEY WRD - INDIANA COMPOSITE LITHOLOGIC LOG

PROJECT: ELKHART		EL KHART	
WELL # I	INTERPRE	TATION BY:	477
DATE: 4//2/27			
FORMATION		From	<u>.</u> To
Sand & Gravel.	325		33
(10%)	:	33	43
Sondy Class	·	(1)	34
Clas	:	54	88
Sond	3 §	·89	92
Sondy Clay	:	92	1-14
San Pa (nove)	503	124	179
Clay		174	· 84.
Grave	98	784	193
Shale		193	19:
		, .	
· · · · · · · · · · · · · · · · · · ·			

77 - 376



DIVISION OF WATER DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA STATE OFFICE BUILDING INDIANAPOLIS, INDIANA 46204 Telephone 633-5267 Area Code 317

WELL LOCATION (Fill in completely - Refer to instruction sheet)
County in which well was drilled Filthart Civil Township Osolo? Include County Road -Names, Numbers, Subdivision Name, lot number, distincting the county Road -Names, Numbers, Subdivision Name, lot number, distincting the county Road -Names, Numbers, Subdivision Name, lot number, distincting the county Road -Names, Numbers, Subdivision Name, lot number, distincting the county Road -Names, Numbers, Subdivision Name, lot number, distincting the county Road -Names, Numbers, Subdivision Name, lot number, distincting the county Road -Names, Numbers, Subdivision Name, lot number, distincting the county Road -Names, Numbers, Subdivision Name, lot number, distincting the county Road -Names, Numbers, Subdivision Name, lot number, distincting the county Road -Names, Numbers, Subdivision Name, lot number, distincting the county Road -Names, Numbers, Subdivision Name, lot number, distincting the county Road -Names, Numbers, Subdivision Name, lot number, distincting the county Road -Names, Numbers, Subdivision Name, lot number, distincting the county Road -Names, Numbers, Subdivision Name, lot number, distincting the county Road -Names, Numbers, Subdivision Name, lot number, distincting the county Road -Names, Numbers, Subdivision Name, lot number, distincting the county Road -Names, Numbers, Subdivision Name, lot number, distincting the county Road -Names, Numbers, Subdivision Name, lot number, distincting the county Road -Names, Numbers, Subdivision Name, lot numbers, subdivision Name, subdivision Name, subdivision Name, subdivision N
Driving directions to the well location: landmarks, etc. Twp. 3811 R. 5E Sec. 32
Southwest Corner of Cak t. & McMaughton Ft.
NAME OF WELL OWNER and/or BUILDING CONTRACTOR
Well Owner U. S. Geological Survey Address 1819 N. Meridian, Indianapolis, Ind.
Building Contractor Address
Name of Well Drilling Contractor: Crtman Drilling, Inc.
717 S. Malfalfa Roed, Kokomo, Indiana
Name of Drilling Equipment Operator: Rick C., Trank G., Lowell C., Den E.
Hame of Dinning Equipment operator.
WELL INFORMATION
Depth of well: Date well was completed: Cc+. 12, 1977
Diameter of casing or drive pipe: Total Length:
Diameter of liner (if used): Total Length:
Diameter of Screen: 2" Length: 5! Slot Size: •040 S: WW. 152' to bottom of screen
Type of Well: Drilled X Gravel Pack Driven Other Other
Use of Well: For Home Test For Industry For Public Supply Stock
Method of Drilling: Cable Tools Rotary Rev. Rotary Jet Bucket Rig
Static water level in completed well (Distance from ground to water level)
Bailer Test: Hours TestedRateg.p.m. Drawdownft. (Drawdown is the differen
Pumping Test: Hours Tested Air Rate 20 g.p.m. Drawdown ft. between static level and wat level at end of test)
Signature Estima Duilfring, Long
_ October 26, 1977

10/10/11 FOR ADMINISTRATIVE USE ONLY (Well driller does not fill out) COUNTY TWP. SEC 3/ Горо Мар Ground Elevation 254 2350 FOW of EL Field Located By 15.5. Date 10.00 Ft N of SL. Depth to bedrock 165 Bedrock elevation 589 Courthouse Location By ______ Date _____ Ft E of WL. Location accepted w/o verification by _____ _____Ft S of NL. Aquifer elevation _____ Lot Number_ 110 33 155 165 122 From 0 122 110 155 FORMATIONS (Color, type of material, hardness, etc.) ravel 200 Ptl (204) 160 PTI (20+) من (tight) sand 160 PCI Ċ និងពនិ [rave] alternate layers jts. **4**ts S blue shale gray clay med. sand Fray clay blve clay 3 hrs. med. NOTE:

U. S. GEOLOGICAL SURVEY WRD - INDIANA

COMPOSITE LITHOLOGIC LOG

PROJECT: FLIKHART	COUNTY:	FLKHART		
WELL # J- 3	INTERPRETATION BY: A. MISA-			
DATE: 4//2// 23.				
FORMATION		FROM	То	
Sound & Graves	425	0	42	
Clay	: :	42.	56	
DIM Soll	3 : 3	56	59	
Clay		59	112	
Dicta Sand	93	110	1a1	
Sandy Clan	:	121	136	
Sand & Grave	53	136	141	
Sorde Clav		10/	144	
Sand & Grand	115	144	155	
C/92		155	165	
Shale	· · · · · ·	165	175	
	(·			

DIVISION OF WATER DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA STATE OFFICE BUILDING INDIANAPOLIS, INDIANA 46204 Telephone 633-5267 Area Code 317



	well was drilled		Road Nam	Civil Towns nes, Numbers,	ship Subdivision	Name, lot	number,	distinctiv
	L OWNER and/or B							
Well Owi	ner		Address			1. 1. 1. 1. 1.	! !	·, ·
-	Contractor							
Name of Well Dr	illing Contractor: _	<u> </u>						
	Equipment Operate		10/ 2)4	F1 10:1				
	ng or drive pipe:	<u>2 S≥o</u>				·3		
Diameter of lines	r (if used): ren:?"		<u> </u>	Fotal Length:				
Diameter of Scre	en:	_ Length:			Slot Size:	المعمر ()	
Type of Well:	Drilled D	Gravel Pack		Driven 🗌		Other	-	
Use of Well:	For Home	For Indus	stry 🗌	For	Public Sup	ply 🔲	Sto	ck 🗌
Method of Drilli	v	ls Rotary		•	_	Bucket	Rig 🔲	
Static water leve	l in completed well	(Distance from grou	and to water	r level)	<u>२२ भ</u>			fee
Bailer Test:		Rate					fown is th	
Pumping Test:	Hours Tested	Rate	g.p.m.	Drawdown.	ft.		en static level end of test	
			Signature _					

DIVISION OF WATER DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA STATE OFFICE BUILDING INDIANAPOLIS, INDIANA 46204 Telephone 633-5267 Area Code 317

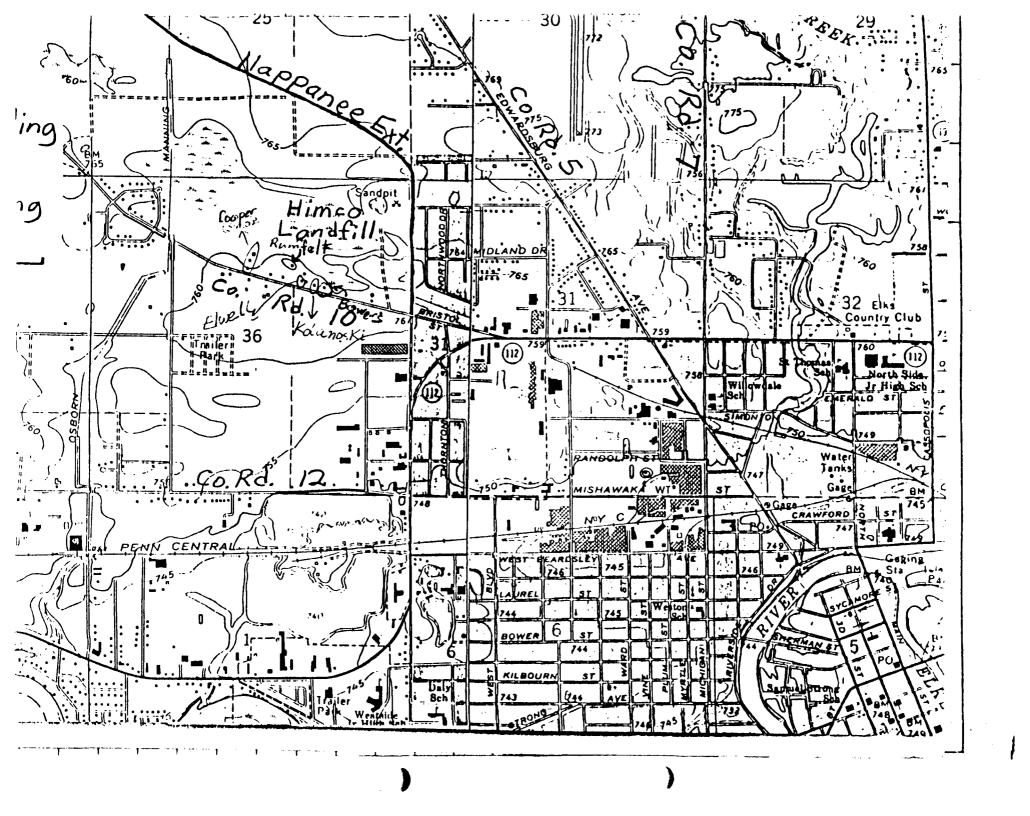


•	well was drilled Civil Township is to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, dis	lincti
	landmarks, etc.	
	L OWNER and/or BUILDING CONTRACTOR	
Well Ow	ner 1548 Address Pig N DEPTIN	
Building	Contractor Address	
Name of Well D	illing Contractor: SAME	
Address		
Name of Drilling	Equipment Operator: 1995	
Diameter of line	Date well was completed: 430.70 ing or drive pipe: Total Length: (if used): Total Length: Slot Size: 40	
Type of Well:	Drilled Gravel Pack Driven Other Other	
Use of Well: 入い	For Home For Industry For Public Supply Stock	
الم Method of Drilli	ng: Cable Tools Rotary Rev. Rotary Jet Bucket Rig	
Static water leve	in completed well (Distance from ground to water level)	fe
Bailer Test:	Hours Tested Rate g.p.m. Drawdown ft. (Drawdown is the dif	
Pumping Test:	Hours Tested Rate g.p.m. Drawdown ft. between static level an level at end of test)	1 wat
	Signature	

DIVISION OF WATER DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA STATE OFFICE BUILDING INDIANAPOLIS, INDIANA 46204 Telephone 633-5267 Area Code 317

9

		_Civil Town	ship			
Include County landmarks, etc.	Road Nam	es, Numbers,	Subdivision	Name, l	ot number,	distinctiv
	_ Address		···	<u> </u>	•	
	_ Address					
N9.63						
الما الما الماسية	1 7.12	15014				
	,		- ,			
Da	te well was	completed:	· · · · ·	`. ,		
7 7725710	T	Total Length:	:	1		
	1	otal Length:				
ength:	! 	6	Slot Size	111) ———	
-						
	_					ck 📙
•				Buck	et Rig 📗	
tance from grou	nd to water	level)	<u> </u>			fee
Rate	g.p.m.	Drawdown	fr		swdown is th	
						C. AHU WAIR
Rate	g.p.m.	Drawdown	fr		l at end of test	
	DING CONTRA Day Carry Cravel Pack For Indust Rotary	DING CONTRACTOR Address Address Date well was For Industry Rotary Rev. F	DING CONTRACTOR Address Address Date well was completed: Total Length: ength: Gravel Pack Driven Driven For Industry For Rotary Rev. Rotary	DING CONTRACTOR Address Address Date well was completed: Total Length: Ength: Gravel Pack For Industry For Public Sup	DING CONTRACTOR Address Address Date well was completed: Total Length: Slot Size: For Industry Rotary Rev. Rotary Jet Buck	DING CONTRACTOR Address Address Date well was completed: Total Length: Ength: Gravel Pack Driven For Industry Road Names, Numbers, Subdivision Name, lot number, landmarks, etc.



Devis 152, 15 gfm (100,544) m sens (and from 126-134)

Befit = 152, 15 gfm (100,544) m sens (and from 126-134)

Befit = 152, 15 gfm (100,544) m sens (and from 126-134)

Befit = 152, 15 gfm (100,544) m sens (and from 126-134)

Befit = 152, 15 gfm (100,544) m sens (and from 126-134)

Before = 152, 15 gfm (100,546) m sens (and from 126-134)

Before = 152, 15 gfm (100,546) m sens (and from 126-134)

Before = 152, 15 gfm (100,546) m sens (and from 126-134)

Before = 152, 15 gfm (100,546) m sens (and from 126-134)

Himso Co. RA. 10 2 Thatisas maran Residents